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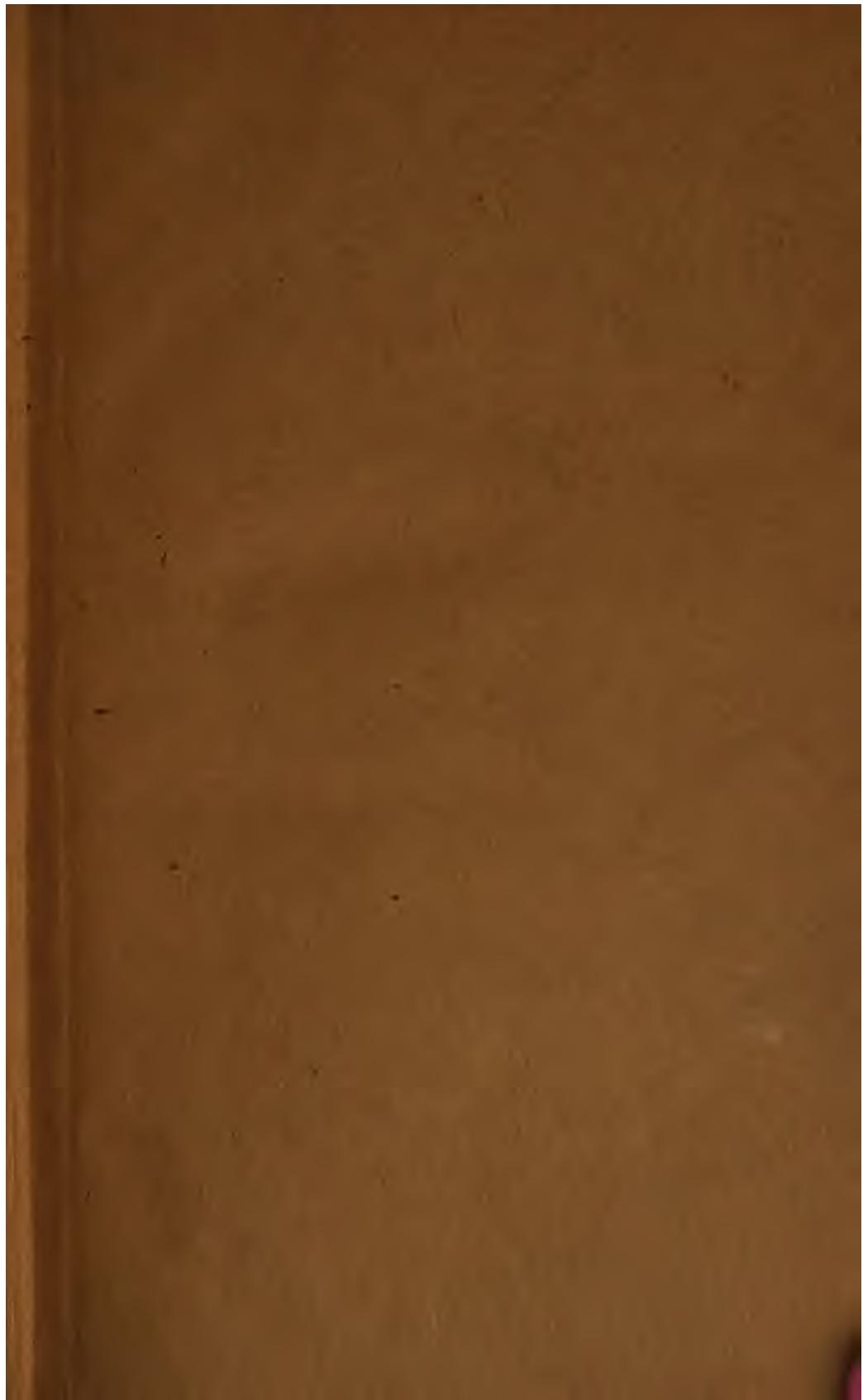
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HONOLULU, HAWAII, Jan. 22, 1908.

Dr. C. S. Sargent,

Director, Arnold Arboretum,
Harvard University,
Jamaica Plain, Mass.

My dear Dr. Sargent:-

Your letter of January 2 is received. The "Hawaiian Forester and Agriculturist" while issued under the auspices of this Board, is not for gratuitous distribution except as an exchange. But the Arboretum is I think entitled to be put on the free list. Accordingly I have directed that from

January 1, 1908, a copy be sent to your Library.

By this mail, under another cover, I am sending you a set of the numbers for 1907. I regret to say that the earlier volumes cannot now be supplied, as many numbers are out of print. I will however endeavor to have a complete set got together. If I succeed in doing this these will be sent to you later, perhaps with a bill, if I am unable to get them free.

Several packages of seed have passed in exchange both ways between this Division and the Arboretum. If there is anything which you specially desire I should be glad to do what I can toward securing it for you.

Sincerely yours,

Ralph S. Hoerner
Superintendent of Forestry.



The
Hawaiian Forester
AND
Agriculturist

ISSUED UNDER THE DIRECTION OF THE
Board of Commissioners of Agriculture and Forestry

VOLUME 4—NUMBERS 1 TO 12 INCLUSIVE

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform Hawaiian readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER & AGRICULTURIST

VOL. IV.

JANUARY, 1907

No. 1

The exhibition of poultry and general agricultural produce, which took place in December under the auspices of the combined poultry and agricultural institutions of Honolulu, was among the most important events of 1906. A marked advance in the standard of excellence evidenced in the poultry over the previous year was apparent, and should be gratifying to all interested in feathered stock. An attractive feature of the undertaking, and one which we hope will be a permanent part of future poultry shows, was the inclusion of an agricultural exhibit. It is unfortunate, however, that the season which finds the birds in good plumage is as a rule deficient in good fruit. With the general exception of oranges, limes, pomelos, pineapples, breadfruit and some others the month of December is not one which can be expected to elicit a good exhibition of general fruit. The winter poultry show should, in time, become a great one to the citrus grower. The development of our citrus fruit industry is greatly to be desired and we look forward to seeing in future winter shows a marked advance in all varieties of citrus fruit.

Now that the experiment of a winter agricultural exhibition has been attempted, the experience gained has shown much that would render a summer exhibition justifiable. Given a thorough and well planned classification of exhibits, an attractive but not unnecessarily expensive prize list, and a few months' notice in order to enable growers to make proper preparations, a fruit and flower show, held under canvas in some one of our beautiful parks, would at once become one of the most popular and enjoyable features of a Honolulu summer. The benefit to be gained from a healthy rivalry among private fruit flower growers, and the experience to be gained from a public opportunity of comparison is incalculable. Indeed, it is not too much to say, that without some such stimulus, very little advance need be expected in the quality of fruit produced by the majority of private growers. And it is to be conceded that with the raising of the standard of fruit among private growers, will, at once, come a demand for better qualities of marketed fruit, so that in a short time, in order to sell fruit, it will be necessary to grow the best. Fruit and flower shows have hitherto been too few in Honolulu, and to this may very greatly be attributed the paucity and poverty of the varieties seen, not only in private yards, but in the open market. As a rule the systematic cultivation of fruit trees is neglected,

Indeed it is the exception to see, when trees have once been set out, any personal care whatever bestowed upon them by the owner. They are almost universally relegated to the attention of a yard boy, upon whose negligence or excessive zeal with the ubiquitous hose, they are solely dependent. Judicious pruning or fertilizing they have none and each crop deteriorates and becomes every year more scanty and less attractive to sight or taste. With a popular annual fruit exhibition, this undesirable condition of affairs would gradually disappear, and owners of good trees would take pride in obtaining the best results from them. Tough, thick-skinned, pithy citrus fruits would be more seldom seen and insect infested and unsightly mangoes and avocado pears would be expelled from the market. Throughout the Territory, the general standard would be raised, until in a few years our fruits, both in quality and quantity, would rival those of any tropical country in the world.

The matter is of sufficient importance to make it the object of a legislative grant. A sum of about two thousand dollars devoted to a summer agricultural exhibition would do much to bring about the condition of affairs we have alluded to. An appropriation of four or five thousand dollars would enable an exhibition, not only of horticulture and agricultural produce, but of general stock, and would attract entries from all the islands. Such an exhibition extending, with other attractions, a week in duration, and assisted by cheap round trip steamer fares would soon be made by residents of the other islands the occasion of a regular annual visit to Honolulu, and would become in time the most popular and enjoyable feature of the Honolulu summer.

In view of the fact that the Forester is the official journal of the Board of Commissioners of Agriculture and Forestry of this Territory, it seems expedient to group together the contributions issuing from the various divisions of the Board. In future therefore all such matter will appear under the general title "Board of Agriculture and Forestry" and will occur as near the beginning of each number as may be convenient. The various Divisions of the Bureau will each have the matter pertaining to it designated under its proper sub-heading. The following Divisions of the Board are in operation: Forestry, Entomology, Animal Industry and Agriculture. Of these, the latter is in coöperation with the Hawaii Experiment Station.

By the above arrangement of the contents of the Forester it is hoped to render information relative to special subjects more accessible. Technical and purely official matter, such as By Authority Notices and Forest Reserve boundaries, will, as heretofore, appear at the end of each issue.

We publish with much satisfaction in this number an extract from President Roosevelt's Message to Congress relative to agriculture and the conditions prevalent in Hawaii. It is gratifying to have such high acknowledgment of the duty of the mother country towards our islands, and to be assured that an effort will be made to assist us in the way most befitting our exigencies. When it is properly appreciated that their isolation has imposed upon the islands duties out of proportion to the size of their community, the day will not be far distant when they will receive the hearty coöperation of the nation.

Mr. Higgins' paper on the cultivation of the Roselle, to which we alluded last month, is included in this number. It will be found of especial interest to the growers of fruit, who hitherto have experienced a difficulty in obtaining that best suited for preserves. The recipes given in the article for the production of jams and jellies are very acceptable, and their use will enable the house-keeper to join to her resources a most agreeable adjunct.

Mr. J. F. Brown, who has taken an active interest in the progress of practical forestry, and has rendered efficient service in matters pertaining thereto, has relinquished his active duties as a member of the Board of Forestry. Mr. Leonard G. Kellogg has been appointed as Commissioner of Agriculture and Forestry for a term of five years to fill the office rendered vacant by Mr. Brown. Notice of this change appears in this number.

Attention is called to an interesting contribution entitled "Seed Distribution in Hawaii" that appears on another page of this issue. The author, Mr. Charles S. Judd, does not need to be introduced to the readers of this magazine. Mr. Judd is now a senior in the Yale Forest School. It will be remembered that as Special Forest Agent, under the Board of Agriculture and Forestry, Mr. Judd last summer had charge of certain forest investigations on Hawaii, during which he had opportunity to visit a number of the places mentioned in his article.

BOARD OF AGRICULTURE AND FORESTRY.
Division of Agriculture.
THE ROSELLE.

By J. E. HIGGINS, *Horticulturist Hawaii Experiment Station.*

Among the different plants that have been experimented with at the United States Agricultural Experiment Station during the past year is the "Roselle" or "Rosella."* This

* The form "Roselle" is most in use in the West Indies and is given the preference in Bailey's Encyclopedia of American Horticulture. The form "Rosella" is common in Australia.

plant was first introduced in Hawaii from Australia, so far as the writer is informed, by Mr. R. A. Jordan. A supply of seeds was secured by the Experiment Station from Porto Rico in 1904 and the plants have been grown on a field scale for two years. It gives promise of being a very useful plant.

USES.

The fruits of this plant consist of a fleshy calyx and a seed-pod which are used in the making of jam, jelly and a cooling drink. The flavor is tart and if not obscured by the use of an excessive amount of sugar, resembles closely that of cranberries. In color and general appearance, both the jam and the jelly are very attractive. The following directions for the manufacture of jam have been used in experiments conducted by Miss Alice R. Thompson of this Station. The data will also show the quantity of jam or of jelly which can be produced from a given number of pounds of fruit. These experiments were conducted with fruit that was rather over mature and the seed-pod was too ripe to be used. When the fruits are young the whole of the fruit may be used.

ROSELLE JAM.

Wash six pounds of Roselles, open and remove the seed-pod. The weight of the flesh will be about three pounds. Add two cups of water to the berries and cook about an hour until reduced to a soft pulp. Measure the cooked fruit and add one and one-fourth cups of sugar to each cup of fruit. Cook twenty minutes.

Six pounds of Roselles will make seven pounds of jam or eleven half-pint cups full.

ROSELLE JELLY.

Wash and seed four pounds of Roselles. The weight of the flesh will be about two pounds. Add four cups of hot water and boil to a pulp. Strain the whole through a cloth bag without pressing. Measure the juice and boil it *continuously* twenty minutes. Then add one cup of sugar for each cup of juice. The sugar should be heated in the oven before adding it to the juice, so that the boiling will not be interrupted. Cook until, on testing the consistency of the liquid by pouring from a spoon, the last drop adheres to the spoon. Remove from the fire and pour into the jars. Four pounds of Roselles will make two pounds of jelly or two half-pint cups full.

THE ROSELLE IN CULTIVATION



CULTURAL METHODS.

It is best to plant the seeds in boxes or seed-beds about the last of February or the first of March in Honolulu and transplant to the open field when the plants have attained a height of six or eight inches. From the experience of the last two years at the Station, there appears to be nothing gained by planting seed earlier than February. Seed planted before this date has produced plants which have borne prematurely and have not produced the main crop any earlier than those from seed planted later. The plants should stand about three to four feet apart in the row and the rows from four to six feet apart. If the soil is good and moisture abundant, four by six feet will not be too great a distance.

The soil for the Roselle need not, however, be the richest, but good soil will yield correspondingly good results. The harvest comes on about November and December in Honolulu. It is quite possible that in other parts of the Islands, other seasons for planting may be found preferable and the crop may mature earlier or later.

The after cultivation will consist only in keeping the soil well tilled and supplied with moisture.

The yields per acre in the experiments conducted at the Station would average from six thousand to seven thousand pounds per acre with a very moderate use of water. The cost of picking these fruits would be from a half-cent to three-quarters of a cent a pound. At four cents per pound net to the grower, these fruits could be placed on the market at a price very much lower than cranberries. Allowing three-quarters of a cent per pound for the cost of gathering, a quarter of a cent for packing materials, there would remain three cents per pound as the value of the fruit on the plants. These at six thousand pounds per acre would represent a value of \$180.00 per acre for the crop in the field.

THE BOTANY OF THE ROSELLE.

The Roselle is known botanically as *Hibiscus sabdariffa*, and belongs to the family "Malvaceae." The home of this plant is thought to be in the Tropics of the Old World. It is now cultivated in many parts of the Tropics.

THE MANGOSTEEN.

While at press, we have received, too late for publication, a communication from Mr. Gerrit P. Wilder, relative to a Mangosteen tree growing at Lihue. Mr. Wilder's letter will appear in the February issue.

BOARD OF AGRICULTURE AND FORESTRY.

Division of Forestry.

GOVERNMENT WASTE LAND.

At a meeting of the Board of Agriculture and Forestry, held on December 21, 1906, there was passed a resolution, based on reports submitted by the Superintendent for Forestry and by the Committee on Forestry, that further defines the policy of the Board in regard to the disposition of waste land belonging to the Territorial Government.

Another report on the land of Kaohe, similar in tenor and purport to those given below, was approved by the Board in December, 1904, and appeared in this magazine in the issue of May, 1905, Vol. II, pp. 124-127.

Following are the resolution and reports first mentioned:

RESOLUTION IN REGARD TO THE LAND OF KAOHE, HAMAKUA, HAWAII.

(Adopted by the Board of Agriculture and Forestry on December 21, 1906.)

Resolved, that the Board of Commissioners of Agriculture and Forestry approves the recommendation of the Committee on Forestry in regard to the retention by the Government from sale or lease of the mauka part of the land of Kaohe, District of Hamakua, Island of Hawaii, contained in a report dated Nov. 1st, 1906, based on a report of the Superintendent of Forestry dated Oct. 13th, 1906.

Resolved, that the Board recommends to the Governor that the portion of Kaohe lying above a line roughly described as beginning on the boundary between Kaohe 4 and 5 at the end of the mauka fence required to be built across Kaohe 4 by a lease sold to Mr. A. M. Brown in December, 1904, and running in a general northwesterly direction, mauka of Puu Ahumoa to Puu Laau, thence northeasterly along the mauka boundary of Paauhau to Puu Kemole, thence mauka of Puu Kaluamakani to a point on the division line between Kaohe 3 and Kaohe 5, thence along said division line to the northwest end of the existing fence across Kaohe 5, built by the Kukaiau Plantation Company, thence in a general southeasterly direction across Kaohe 5, following said fence, to the Humuula boundary, thence following said Humuula boundary to the south and west around Mauna Kea to the southeast line of Kaohe 4, thence across Kaohe 4, following the above described fence to the point of beginning, and also the portion of the land of Kaohe that lies above the Keamuku and the 1843 lava flows on the north slope of Mauna Loa, be for the present reserved by the Government from sale or lease and retained by the Land Office as waste land.

REPORT OF THE COMMITTEE ON FORESTRY.

Honolulu, T. H., Nov. 1, 1906.

Board of Agriculture and Forestry,
Honolulu.

Gentlemen:—Your Committee has had under consideration the report of the Superintendent of Forestry, dated Oct. 13th, 1906, concerning the land of Kaohe, District of Hamakua, Island of Hawaii.

The upper portion of the said land should, in the judgment of your Committee, be classed as waste land, being unsuited for any economic use now known.

But in order that it may be available in future when it is possible that some use may be found for it, your Committee are in favor of its retention from sale or lease by the Government.

Your Committee therefore recommend that the Board approve the suggestions of the Superintendent of Forestry and that a recommendation embodying them be adopted by the Board and transmitted to the Governor and to the Commissioner of Public Lands.

We remain,

Your obedient servants,

Very respectfully,

L. A. THURSTON,

W. M. GIFFARD.

Committee on Forestry.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

Honolulu, Oct. 13, 1906.

Committee on Forestry,

Board of Agriculture and Forestry,
Honolulu.

Gentlemen:—I have to submit the following report upon the land of Kaohe, District of Hamakua, Island and County of Hawaii, with the recommendation that certain portions of this tract be reserved from sale or lease, as waste land.

Kaohe is the largest single land in the Territory, its area being given in the last Land Office List as 218,257 acres. It includes practically all of the upper slopes of Mauna Kea and a good share of the northern slope of Mauna Loa. For purposes of classification in the Land Office, Kaohe is divided into six parts. Kaohe 1 is cane land under a five-year lease, expiring in 1909. Kaohe 6 is open grazing land not under lease. All of the remainder of Kaohe consists of grazing, open forest and waste land. A portion of Kaohe 2 (1,035.6 acres) is under lease until January 10, 1909. The lease on the remainder of Kaohe 2, with those on Kaohe 3, 4 and 5 expired on September 9, 1906, but a new 21-year lease

for a portion of Kaohe 4 went into effect the next day. This lease was sold to Mr. A. M. Brown during the winter of 1904.

Kaohe 2 and the lower portion of the other three tracts are primarily of value for grazing and should in my judgment be so used, except as hereinafter noted. Above an elevation of about 5,000 feet there is a fairly dense growth of Mamani (*Sophora chrysophylla*) making a practically pure stand, which extends up the mountain to an elevation of about 8,000 feet. Within the last ten years the belt of Mamani has, through natural reproduction, been extended both up and down the mountain and the process is still going on. Just why the Mamani should have taken this sudden start is not clearly understood, the usually excepted theory being that prior to about 10 years ago some insect or other pest held the reproduction in check. Unless a paddock is heavily overstocked cattle do not interfere with the growth or reproduction of Mamani. In fact over a considerable part of the Mamani belt the trees are coming up so thickly as almost to preclude grazing. Obviously no artificial protection is required for this type of forest.

The Mamani forest extends some distance above the area of good grazing land, which is marked by the upper limit of the valuable native and introduced grasses. The section above the Mamani belt being without valuable vegetation is of little account for grazing. It is for the most part now used only by wild cattle and horses. There seems at present no economic use to which it can be put.

In the leases that have just expired this area of waste land was included with the good land below, thrown in as it were as a sort of "manuahi," thereby greatly swelling the acreage under lease, but being of little value to the lessee. In my opinion this arrangement serves no good end and should in future be discontinued; the land of value for grazing being leased as such and the remainder held by the Government as waste land.

In a report upon the land of Kaohe 4 made to the Board under the date of Dec. 3rd, 1904, I made similar recommendations in regard to the mauka part of that tract. These were adopted and when the lease was made to Mr. Brown only the good grazing land was included, thus establishing a precedent in regard to waste land. I now recommend that when Kaohe 3 and 5 are re-leased the portion above the following roughly described line be excluded and retained by the Land Office as waste land:

Beginning on the boundary between Kaohe 4 and 5 at the end of the fence required to be built across Kaohe 4, the line should run mauka of Puu Ahuamo to Puu Laau, thence along the mauka boundary of Paauhau to Puu Kemole, thence mauka of Puu Kaluamakani to a point on the division line between Kaohe 3 and Kaohe 5, thence along said division line to

the northwest end of the existing fence across Kaohe 5, built by the Kukaiau Plantation Company, thence across Kaohe 5 following said fence to the Humuula boundary, thence following said Humuula boundary to the south and west around Mauna Kea to the southeast end of the fence required to be built across Kaohe 4 and along the same to the initial point.

Mr. A. W. Carter, representing the Parker Ranch, has proposed to lease the grazing land in Kaohe 3, with a proviso in the lease that a fence be built and maintained across Kaohe 3 following the line just described. Across Kaohe 5 a fence built sometime ago by the Kukaiau Plantation Company (the one mentioned in the above description) marks the division between the good grazing and the waste land.

With the building of the fences on Kaohe 3 and 4 and the gradual capture of the wild cattle on the mountain, facilitated thereby, stock will be kept off this upper section.

The retention by the Land Office of this area of waste land is directly in line with the policy of the administration to put the government land to its best use and furthermore it leaves what is now an unavailable tract in such shape that if a use is found for it in later years it will then be available for lease or sale. With the introduction of new grasses it is quite possible that the area of good grazing land may in time be extended mauka, while there seems to me no good reason why much of the area on the sides of Mauna Kea, between the elevation of 8,000 and 10,000 feet could not be made to grow forest trees from the temperate zones, such as Pines, Firs and Spruces, that in time could be looked to to supply construction timber. The establishment of such a forest belt would, of course, entail a considerable expense, even though the method of scattered seed spots were adopted, but experiments have been begun to determine what species are best adapted for use in this locality. Funds for more extended work are not now in sight.

Kaohe 2.

On the part of Kaohe 2, between the mountain road and the upper line of the upper Pohakea homesteads, the forest has been destroyed by one cause and another, the chief among them being fire, until with the exception of a few groves of Koa and a section of the Mamani belt, practically the whole area is open country which could only be reforested by artificial means. Except for the Koa groves already mentioned there are not enough trees left to furnish seed, even were the other factors governing natural reproduction favorable, which is distinctly not the case.

Realizing the importance of the protection which an open

forest affords stock the Kukaiau Plantation has proposed to Mr. Pratt that he put up Kaohe 2 for lease with the requirement that a certain part of the land be planted with Blue gum (*Eucalyptus globulus*) trees; the stock to be kept out until the trees grow large enough to care for themselves. I heartily approve of this plan and am now having prepared by Mr. Haugs a planting plan under which the work could be done.

If natural reproduction of Blue gum takes place in Hamakua as it has in certain other upland districts of the Territory this section may in time come under a forest cover of this Eucalypt.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

CHANGE OF FOREST RESERVE BOUNDARY.

Significant action was taken by the Board of Agriculture and Forestry on December 21, 1906, when a resolution was adopted approving the recommendation of the Superintendent of Forestry that the location of the boundary of the Halelea Forest Reserve be modified to exclude certain land that it had been found could be used for agriculture. This is the first case to come up under the law passed at the last session of the Legislature (Act 65 of 1905) that permits the Governor to withdraw land from forest reserves. A surveyor is now on the ground. When his work is completed a further report, with recommendations will be submitted to the Board by the Superintendent of Forestry.

Following are the reports and resolution above mentioned:

**RESOLUTION IN REGARD TO A PROPOSED CHANGE IN THE BOUNDARY
OF THE HALELEA FOREST RESERVE, ISLAND OF KAUAI.**

(Adopted by the Board of Agriculture and Forestry on
December 21, 1906.)

Resolved, that the Board of Commissioners of Agriculture and Forestry approves the recommendation of the Committee on Forestry in a report dated November 1st, 1906, based on a report of the Superintendent of Forestry, dated October 15th, 1906, that the makai boundary line of the Halelea Forest Reserve be relocated with the idea of excluding from the reserve certain areas which it is believed can be used for diversified industries more advantageously than for forest.

Resolved, that the Board approve as defining its policy on the subject so brought up, the statement, that when it becomes possible through changed conditions of market, transportation,

etc., to develop in a legitimate and profitable way, without detriment to the main object of a given forest reserve, potentially agricultural land that may have been included in that reserve, the Board does not oppose the modifying of the reserve boundaries, upon demand, as provided by law.

REPORT OF THE COMMITTEE ON FORESTRY.

Honolulu, T. H., Nov. 1, 1906.

Board of Agriculture and Forestry,
Honolulu.

Gentlemen: Your Committee on Forestry beg to report that they have had under consideration the report of the Superintendent of Forestry, dated Oct. 15th, 1906, concerning a proposed modification of the Halelea Forest Reserve, in the District of Halelea, Island of Kauai.

In his report the Superintendent of Forestry points out that because of the development of the rubber industry in the Islands it has become possible to use a portion of the area now included in the reserve for a rubber plantation, and that this can be done without interfering with the value of the reserve as a whole. He accordingly recommends that the reserve boundary be so modified as to exclude the section in question.

This is the first case to come up under Act 65 of the Laws of 1905, which provides for altering the boundaries and area of existing forest reserves. Action taken in these premises will therefore in a measure establish a precedent.

Your Committee have carefully considered the question and while reserving an expression of opinion upon the relocation of the boundary until more data are in hand, do hereby approve the general position taken by the Superintendent of Forestry.

To this end your Committee recommend that the Board approve, as defining its policy on this point, the statement that when it becomes possible through changed conditions of market transportation, etc., to develop in a legitimate and profitable way, without detriment to the main object of a given forest reserve, potentially agricultural land that may have been included in that reserve, the Board is in favor of modifying the reserve boundaries upon demand, as provided by law.

We remain,

Your obedient servants,

L. A. THURSTON,

W. M. GIFFARD,

Committee on Forestry.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

Honolulu, Oct. 15, 1906.

Committee on Forestry,
Board of Agriculture and Forestry,
Honolulu.

Gentlemen: I beg to submit the following report upon a proposed modification of the makai boundary line of the Halelea Forest Reserve, in the District of Halelea, Island and County of Kauai:

Following an application from Mr. W. E. Rowell of this city to purchase from the Government, with adjoining government lands, a portion of the land of Waioli within the reserve—on which it is proposed to grow rubber—Mr. J. W. Pratt requested me to re-examine the reserve boundary and make a report containing my conclusions in regard to a modification of the location of the line. Accordingly I arranged to visit Hanalei during my recent trip to Kauai, and on September 22, 1906, went over the ground in question in company with Mr. Rowell and Mr. F. E. Harvey of the Survey Office, we three having met at Lihue by appointment the day before.

The main object of the Halelea Forest Reserve is the protection of the forest cover on the Halelea watershed against the time when the streams may be turned to account for the production of power or for irrigation. The makai line of the reserve as originally laid out was intended to, and at that time did, clear all the land which was believed to be suitable for agriculture or grazing or which it was thought could be profitably used in this way for many years. But recent developments in the rubber industry have made it appear that certain protected gulches, now under forest, just within the reserve boundary, might profitably be used for growing rubber. It is Mr. Rowell's intention to organize a stock company for this purpose and because of the obstacles that the five-year-agricultural-land clause place in the way of a new industry, to acquire the tract by purchase. Mr. Rowell also contemplates leasing the similarly situated area on the Bishop Estate lands of Waipa and Lumahai. As the same conditions obtain on these lands as on Waioli the examination was made to include them as well.

The question before me in this examination was whether or not a relocation of the forest line, cutting out the area desired, could be made without detriment to the objects for which the reserve as a whole stands.

The present line takes in portions of the wooded area at the upper end of the gentle slope at the foot of the main pali and also a few small wooded gulches on the sides of two or three of the more prominent lateral ridges. As surveyed it runs

between conspicuous points on the ridges; the idea being, in common with other forest reserve lines, that if it should become necessary to fence the boundary, the fence would be built on the best natural lines between these points. To exclude the land desired by Mr. Rowell would push the boundary back and make it run directly at the base of the main pali, leaving outside all the gently sloping area. Neither the total area nor the area on any one land excluded from the reserve can be told exactly at this time, but the total area for the three lands would probably be something less than one thousand acres.

As the important streams head high up in the mountains and are only affected in a slight degree if at all by the strip in question, its retention in the reserve is not a matter of great importance. It was included in the first place because being unavailable for agriculture and under forest it appeared to belong with the reserve rather than with the lower land.

From my previous study of the general situation, with the additional acquaintance with the district gained by looking at the problem from this new point of view, I believe that the reserve boundary can be modified without detriment to the value of the reserve as a whole, especially as the portion proposed to be excluded would still remain at least in part under a cover of trees.

For this reason I recommend that the makai line of the Halelea Forest Reserve be so relocated as to exclude the area desired by Mr. Rowell.

In connection with the work at Hanalei Mr. Harvey is soon to locate the points on the proposed line. When his description is at hand I shall transmit a copy of it to this Committee, with the further recommendation that it be adopted as the official line, after a public hearing held under the terms of Chapter 28 of the Revised Laws as amended by Act 65 of the Session Laws of 1905.

The present recommendation is made with the full understanding that if followed it will tend to establish a precedent for future action, although by no means one which must necessarily be followed in all cases, for in forest reserve matters each case is decided on its own merits. It is made advisedly as another link in the chain of forest policy that is gradually being forged for this Territory. For when it becomes possible without detriment to the main object of a given forest reserve, to develop in a legitimate and profitable way potentially agricultural land that may have been included within its boundaries, I believe it is not only good policy but good sense to do so.

In conclusion I recommend that a copy of this report be sent to Mr. J. W. Pratt for his information.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

POULTRY AND AGRICULTURAL EXHIBITION.

SECOND ANNUAL EXHIBIT OF THE HAWAIIAN POULTRY ASSOCIATION IN COÖPERATION WITH THE FARMERS' INSTITUTE OF HAWAII.

The exhibition of combined poultry and agricultural products which took place in the latter part of December was, for the agriculturist, among the most pleasant and valuable recollections of the year that has just closed. A general desire had been evidenced at the first exhibition of the Poultry Association in 1905, to extend the range of its exhibits in order to appeal to a wider circle of patrons, and the suggestion of including agricultural commodities at future exhibitions elicited encouraging evidences of success. The scope of the second annual poultry exhibit was therefore enlarged and the coöperation of various societies and institutions enlisted to undertake its organization. Of these the Farmers' Institute of Hawaii, the Board of Agriculture and Forestry and the Hawaii Experiment Station rendered efficient help, and together with the exertions of many private agriculturists rendered the affair a most gratifying success.

I. POULTRY EXHIBIT.

The opening of the exhibition found every bird in place and the awards all posted. The number of individual exhibitors was but slightly under last year's total. The number of birds entered and shown in the poultry classes was somewhat in excess of the previous year's show, and the quality was of a higher average. The large hall and ample provision of new and attractive coops added much to the appearance of the exhibition.

The judging was by the comparison system, and was capably conducted by Judge B. M. Woodhull of Stockton, California. His decisions were accepted with satisfaction; and his readiness to explain to exhibitors the defects or disqualifications of their birds made for him many additional friends.

The prizes awarded included silver cups, merchandise in great variety, generously offered by the merchants, and cash prizes by the Association. The latter item will figure more conspicuously in

future exhibitions, now that the Association is equipped with permanent coops.

The poultry classes were well represented, some of them being large and the competition strong; while others were in some instances only sufficient in number to represent the breed.

In the American class the Barred Plymouth Rocks were again in the lead, 73 birds being shown, some of which were grand specimens. The White Plymouth Rocks were fewer, but equally fine. In Wyandottes, the Silver Laced, White, Buff and Columbian were shown, the latter being seen here for the first time and attracting much attention by their close resemblance to the Light Brahma. A choice pen of Rosecomb Rhode Island Reds were sent from Hawaii.

The Asiatic class showed Light and Dark Brahma, Buff and Partridge Cochins, and Black Langshans, all of good quality.

The Mediterranean class was fairly represented in White Leghorns, the Brown and Buff varieties being few. Minorcas were well represented in both the Black and White varieties, the latter being shown here for the first time. The Blue Andalusian was also represented.

In the English class, the Dorkings and the Buff and Black Orpingtons were very attractive.

The Game class although small was good, and but few specimens of Bantams were exhibited.

In Ducks, the Pekin led with several fine specimens. There were also White and Colored Muscovies, and Indian Runner, the latter having been sent from Hawaii. But one exhibit of Geese was made, a pen of Toulouse. White, Bronze and Black Turkeys were also shown. Capons were notably few. The egg display was small, though attractive.

The Pigeon classes were fairly represented by birds of rare good quality. Here there was a great falling off in entries and number of exhibits.

A notable incident of the show was the disqualification of the best Barred Plymouth Rock cock through his misfortune of being entered in a pen containing a hen with a disqualifying defect.

A general tendency to underweight was noticeable in most classes. As will be seen "general purpose" breeds, constituting the American class, greatly outnumbered other exhibits.

II. AGRICULTURAL EXHIBIT.

The agricultural department of the exhibition naturally falls under four heads, the displays of the Board of Agriculture and Forestry, the Hawaii Experiment Station, the general competitive exhibition and private collections not entered for competition.

BOARD OF AGRICULTURE.

The display of the Board of Agriculture and Forestry was arranged in order to represent the development of Forestry in Hawaii. For this purpose large maps were exhibited to display in graphic form the areas at present under the beneficial control of the Board's supervision, and such tracts whose inclusion as forest reserve is now contemplated.

A most instructive series of young growing trees at various stages of growth was also shown, to represent methods of propagation as adopted by the King Street Nursery. An examination of these afforded to the novice a lesson in practical tree cultivation, in a manner which would be the most readily retained and put into practice. Samples were also shown of the banana leaf pots adopted by the nursery for small plants. By the use of these pots the roots are not disturbed in transplanting as the whole pot and its contents are planted together.

The present development of interest in the cultivation of rubber also received attention, and specimens of all the species likely to become of economic importance in the islands were shown. Besides these a good display of general palms and foliage plants was arranged and also a collection of the literature of the Board for general distribution among visitors.

HAWAII EXPERIMENT STATION.

The exhibition of the Hawaiian Agricultural Experiment Station was devoted in the main to a representation of the various industries of the Territory. Of these probably the most important of those shown was that devoted to tobacco. The cultivation of this plant is the youngest of the many new crops which have of late been made the subject of experiment in the islands, and together with that of rubber is anticipated to extend largely in the future and to hold a prominent place in our agricultural resources. Samples of Hawaiian grown wrapper, binder and filler tobaccos were shown and also specimens of cigars manufactured from Hawaiian tobacco. This exhibit attracted much attention and was considered one of the chief features of the Station's display.

Excellent work is being done by the Hawaii Experiment Station in the development of a new rice, suited to our peculiar requirements. Six specimens of promising new rices were shown by Mr. F. G. Krauss, who is in charge of the investigation which is being conducted. These were selected from one hundred varieties which were grown in a comparative test in the fall of 1906. Series of rice plants, illustrating extreme types and varieties, and plants grown from selected and

ordinary stock were also shown, together with illustrations of the progress of the experimental investigations

Samples of the different grades of coffee of the principal coffee growing countries of the world afforded an excellent opportunity for comparison of which many growers availed themselves.

One of the most important of our smaller industries is the production of honey. The display of this product was exceedingly attractive. A series of fifty samples of Hawaiian honey of different colors, honey in the comb, and bees-wax in glass jars and in cases for shipment were shown. An observatory hive of the newly introduced Cyprio-Carniolan race was also a feature. This new bee gives promise of equaling or even excelling the qualities of the best Italian bees at present in Hawaii.

The cultivation of silk was represented by cocoons, by raw and waste silk. That shown was grown at the Experiment Station. It is of fine quality and demonstrates that the islands can produce excellent silk which affords promising economic results in the reeling. Samples of silk produced on Kauai by Messrs. Ladd & Co. in 1842 were also displayed.

The shipments of fruit from the islands is increasing very rapidly. This feature of Hawaiian export trade has received special attention from the Experiment Station which recently dispatched Mr. Higgins to the Coast in order to ascertain the most advantageous methods of packing Hawaiian fruit. At the exhibition various wooden crates which have been successfully employed for this purpose were shown, ready packed with fruit for shipment. The fruit neatly wrapped in paper and protected with corrugated strawboard, looked very attractive. The crates exhibited were primarily intended for avocado pears and papayas, various sizes of each of which were shown.

In coöperation with the Territorial Board of Health, the Experiment Station presented the work which is now in progress for the control of mosquitoes. An aquarium of the imported top-minnows, or mosquito-eating fish, attracted much interest. Aquaria containing developing mosquito larvae afforded excellent object lessons of the danger of allowing standing water. From these the mosquito fish were fed and the wonderful work of these voracious little creatures appreciated. Figures explanatory of the life-cycle of the mosquito were shown and also photographs, illustrations and posters illustrating the work of control.

Exhibits of the principal injurious insects of the Territory were presented in conjunction with the various insecticide remedies most effectual to check them. Series of fruit and plant

scale insects in connection with their food plants also afforded an instructive lesson.

AGRICULTURAL COMPETITIVE EXHIBITS.

The number of specimens shown in this department were disappointingly few. It is safe to say that in addition to the unfavorable season of the year, this condition was due to the fact that the initiation of an agricultural exhibition left many possible exhibitors in doubt as to the standard of quality expected. Another year will, without doubt, remedy this and many fruit growers will be encouraged to send specimens, who this year for one reason and another held aloof.

The judges of the agricultural exhibition were Dr. Wm. T. Brigham and Messrs. Gerrit P. Wilder and J. E. Higgins.

EXHIBITS AND PRIZES.

Class 1.—Decorative Plants (Potted): Palm ferns, caladiums, etc. First prize, \$5.00. H. J. Rhodes.

Class 2.—Flowering Plants (Potted): Orchids, chrysanthemums, etc. Two prizes offered. No entry.

Class 3.—Cut Flowers: Roses, carnations, lilies, etc. Two prizes offered. No entry.

Class 4.—Fruits: Oranges, lemons, limes, pomelos, grapes, mangoes, guavas, star apples, pomegranates, figs, papaias, strawberries, tamarinds, avocados, loquats, pineapples, bananas, grenadillas, breadfruit, mangosteen, etc. First prize, \$5.00; Lunalilo Home. Second prize; no award.

Class 5.—Oranges. Fourteen entries. First prize, \$1.00; Dorothea Krauss. Second prize, red ribbon; Judge W. F. Frear.

Class 6.—Lemons. No entries.

Class 7.—Limes. Two entries. First prize, \$1.00; Lunalilo Home.

Class 8.—Pomelos. Four entries. First prize, \$1.00; W. E. Hall, Honolulu. Second prize, red ribbon; Byron O. Clark.

Class 9.—Grapes. No entry.

Class 10.—Figs. No entry.

Class 11.—Papaia. No entry.

Class 12.—Pineapples. One entry. First prize, \$1.00; Haiku Fruit Packing Co. Second prize, red ribbon; Haiku Fruit Packing Co.

Class 13.—Strawberries. Two entries. First prize, \$1.00; Byron O. Clark.

Class 14.—Bananas. One entry. No award.

Class 15.—Grasses and Fodder Plants. Three entries. First

prize for largest and best collection, \$2.50; Moanalua Dairy.

Class 16.—Miscellaneous: Honey, silk, etc.

In each of the above classes two prizes were offered. In class 12, the Wahiawa Consolidated Pineapple Company sent in a splendid lot of fruit too late for competition.

SPECIAL PRIZES.

First prize, Blue Ribbon; second prize, Red Ribbon.

Taro. One entry. First prize, Judge W. F. Frear.

Pomegranates. Three entries. First prize, Judge S. B. Dole; second prize, Judge S. B. Dole.

Yellow Sapota. One entry. First prize, E. W. Jordan.

Bread Fruit. One entry. First prize, Judge S. B. Dole.

Wi. Four entries. First prize, W. M. Giffard.

Mangoes. One entry. First prize, Mrs. W. L. Bowers.

Avocadoes. One entry. First prize, Byron O. Clark.

Mandarin Oranges. Four entries. First prize, W. C. Weedon.

Carambola. Nine entries. First prize, Mrs. T. E. King.

The general quality of the above fruits was very commendatory. Of these Judge Dole's bread fruit and pomegranates, Mr. Weedon's Mandarin oranges and Mr. W. M. Giffard's Wi fruits were particularly fine. The exhibition of Mangoes and Avocadoes were noteworthy as being cultivated at this season of the year. Among the more unusual fruits the Yellow Sapota attracted much attention and was generally admired. The number of Carambolas shown was somewhat unexpected, although there were some growers of this handsome fruit who were not represented.

EXHIBITS NOT COMPETITIVE.

The exhibition was indebted to Mr. Gerrit P. Wilder for a most excellent series of plaster casts of mango fruit. These ranged in size and coloring to a wonderful extent and formed a very pretty and attractive series. Mr. Wilder has been for many years one of our foremost pomologists and has done much, not only to introduce new species of fruit to Hawaii, but also in the development of improved varieties of mangoes.

A magnificent exhibition of potted palms and plants was displayed by Mr. S. M. Damon, Moanalua, through Mr. McIntyre. These added a particularly attractive feature to the show.

SEED DISTRIBUTION IN HAWAII.

BY CHARLES S. JUDD.

In the study of seed distribution it may be interesting to note a few phases of that phenomenon in Hawaii and to cite a few examples.

Seeds may be distributed in many different ways, but perhaps the most profound method is by ocean currents. It was the carrying of sea beans by ocean currents to the Orkney Islands, north of Scotland, that suggested to Hans Sloane as early as 1693 the existence of the current which was afterwards known as the Gulf Stream. These beans were recognized by him as the seeds of plants he had seen in his botanical investigations in Jamaica. On our own shores any day these beans may be picked up, but they have been simply washed down from the interior of the islands by the streams and carried along the beaches by the tides and shore currents. In the same manner, the fruit of the Milo (*Thespesia populnea*) which possesses cavities filled with air and consequently floats well, may be seen along the beaches, often germinating in the sand. Also, the round nuts of the Kamani (*Calophyllum inophyllum*) and the almond-shaped fruits of the *Terminalia catappa*, also called "Kamani." On the beach at Hanalei, after a storm, thousands of young Ironwood trees come up, the seeds being washed along the sands. Safford says that on the island of Guam "hundreds of these (ironwood) seeds, together with the queer-shaped Barringtonia fruits, are always to be found germinating on the stretches of sandy beach along the southern portion of the east coast of the island."

While seeds may be carried along our shores by the tides and shore currents it is improbable that we can ascribe much credit to ocean currents for bringing us the seeds of our useful plants, on account of the isolation of our islands and the adverse direction of these currents. One thing the currents of the ocean do bring us and that is the huge logs and stumps from Oregon and Washington which the natives constantly discover on our shores and find so useful.

In another manner water has an influence in seed distribution. Look up the side valleys of any of our larger valleys back of Honolulu and note whether the light foliage of the Kukui is most prominent, on the ridges or in the valleys. The fruit, falling from the tree partly rolls down the slopes, but for the most part is washed into the valley-bottoms, there to germinate. In the ironwood grove of the Lihue Plantation, just above the famous "hollow tree," there exists a young stand of Kukui so thick that a person cannot force his way through them. The nuts were washed down the valley in large quantities, there to germinate and form a dense stand.

The wind is another very important and useful agent in seed dissemination. In fact some of the silvicultural systems in European and American forestry depend upon this natural agent in the re-stocking of the stands of light-seeded trees. For example, the light seed of the Tulip tree in the Alleghany Mountains is known to have been carried by the wind for a distance of a mile. It is fortunate indeed, that two of our most widely planted economic trees, the Ironwood and Silk Oak, possess light, winged seeds which can be carried to some distance by the wind. Safford states that the seeds of the Ironwood are so light that "when a handful of them is thrown into the air, they resemble a swarm of flying insects." At Papalinaho, on Kauai, young Ironwood seedlings continually come up in the sandy soil over 300 feet distant from the parent trees, the seeds being carried there by the wind. This property of the seed, of being carried by the wind, will greatly aid in the distribution of these two species and will make their spread more rapid.

Birds, also, are in many cases responsible for the distribution of many heavy-seeded plants. In the southern States of New England it is an accepted fact that the spread of the Red Cedar on the abandoned pastures is due to the birds who carry and drop the seeds there. We have only to look upon our own hills to see how the Lantana has been scattered widespread over the land by the turtle-dove. This plant was unfortunately introduced in 1858 and has been carried far and wide by birds, which feed on the aromatic berries, not only over the pasture lands, ruining them, but even up to pockets on the cliffs where not even the nimble goats may climb. About the most useful example of seed distribution by birds is found at Lihue, Kauai, and, I doubt not, in many other parts of the islands. Here the fruit of the Java plum is picked by mynah birds for its juicy pulp and the seeds are thus carried over the country and dropped, especially in the vicinity of Huleia Gulch. It is found coming up not only through Lantana thickets and on rich soil, but also on the dry-barren ridges where nothing else will grow. The tree is useful for fuel but in growing on these barren places it will serve the much more useful purpose of acting as a ground cover in hindering run-off and preventing the further erosion of the soil.

Seed distribution by animals possesses the best example in the extensive occurrence of the Algaroba tree in the Hawaiian Islands. Introduced as a small slip in 1837 by Father Bachelot it has spread most wonderfully over large areas, so sterile as to support no other tree growth. It now furnishes fuel for the use of man, fodder for cattle and horses, and honey for bees. This widespread and rapid distribution of Algaroba is due entirely to horses and cattle. When the pods are eaten, the small, horny seeds are not only not injured by the animals but, on the contrary, are even prepared for quick germination by the action of the digestive

fluids. This fact was made use of by Mr. W. H. Rice in establishing a grove of Algaroba trees at Kipukai, Kauai. This gentleman had repeatedly planted this species there with no success, and so resorted to the following expedient: He fed a drove of mules with Algaroba pods and then sent them over the mountains to Kipukai and turned them loose on the land. The result was the establishment of a full stand of trees. In seven years he has thus secured a dense grove of about 15 acres, which not only supplies shade and fodder for his animals, but also fuel for his men who formerly had to depend upon driftwood.

PRESIDENT ROOSEVELT'S MESSAGE TO CONGRESS.

THE PROGRESS OF AGRICULTURE.

The recent message of the President to Congress contains much that is important in relation to the agricultural condition in Hawaii. The following paragraphs are of particular interest to our readers:

The only other persons whose welfare is as vital to the welfare of the whole country as is the welfare of the wageworkers, are the tillers of the soil, the farmers. It is a mere truism to say that no growth of cities, no growth of wealth, no industrial development can atone for any falling off in the character and standing of the farming population. During the last few decades this fact has been recognized with ever-increasing clearness. There is no longer any failure to realize that farming, at least in certain branches, must become a technical and scientific profession. This means that there must be open to farmers the chance for technical and scientific training, not theoretical merely, but of the most severely practical type. The farmer represents a peculiarly high type of American citizenship, and he must have the same chance to rise and develop as other American citizens have. Moreover, it is exactly as true of the farmer as it is of the business man and the wageworker, that the ultimate success of the nation of which he forms a part must be founded, not alone on material prosperity, but upon high moral, mental and physical development. This education of the farmer—self-education by preference, but also education from the outside, as with all other men—is peculiarly necessary here in the United States, where the frontier conditions even in the newest States have now nearly vanished, where there must be a substitution of a more intensive system of cultivation for the old, wasteful farm management, and where there must be a better business organization among the farmers themselves.

ORGANIZATION IS NECESSARY.

Several factors must coöperate in the improvement of the farmer's condition. He must have the chance to be educated in the widest possible sense—in the sense which keeps ever in view the intimate relationship between the theory of education and the facts of life. In all education we should widen our aims. It is a good thing to produce a certain number of trained scholars and students; but the education superintended by the State must seek rather to produce a hundred good citizens than merely one scholar, and it must be turned now and then from the class book to the study of the great book of nature itself. This is especially true of the farmer, as has been pointed out again and again by all observers most competent to pass practical judgment on the problems of our country life. All students now realize that education must seek to train the executive powers of young people and to confer more real significance upon the phrase "dignity of labor," and to prepare the pupils so that in addition to each developing in the highest degree his individual capacity for work they may together help create a right public opinion, and show in many ways social and coöperative spirit. Organization has become necessary in the business world, and it has accomplished much for good in the world of labor. It is no less necessary for farmers. Such a movement as the grange movement is good in itself and is capable of a well-nigh infinite further extension for good, so long as it is kept to its own legitimate business. The benefits to be derived by the association of farmers for mutual advantage are partly economic and partly sociological.

THE GOVERNMENT CAN HELP.

Moreover, while in the long run voluntary effort will prove more efficacious than Government assistance, while the farmers must primarily do most for themselves, yet the Government can also do much. The Department of Agriculture has broken new ground in many directions, and year by year it finds how it can improve its methods and develop fresh usefulness. Its constant effort is to give the governmental assistance in the most effective way; that is, through associations of farmers rather than to or through individual farmers. It is also striving to coördinate its work with the agricultural departments of the several States, and so far as its own work is educational, to coördinate it with the work of other educational authorities. Agricultural education is necessarily based upon general education, but our agricultural educational institutions are wisely specializing themselves, making their courses relate to the actual teaching of the agricultural and kindred sciences to young country people or young city people who wish to live in the country.

Great progress has already been made among farmers by the creation of farmers' institutes, of dairy associations, of breeders' associations, horticultural associations and the like. A striking example of how the Government and the farmers can coöperate is shown in connection with the menace offered to the cotton growers of the Southern States by the advance of the boll weevil. The Department is doing all it can to organize the farmers in the threatened districts, just as it has been doing all it can to organize them in aid of its work to eradicate the cattle fever tick in the South. The Department can and will coöperate with all such associations, and it must have their help if its own work is to be done in the most efficient style.

IRRIGATION AND FOREST PRESERVATION.

Much is now being done for the States of the Rocky Mountains and Great Plains through the development of the national policy of irrigation and forest preservation; no Government policy for the betterment of our internal conditions has been more fruitful of good than this. The forests of the White Mountains and Southern Appalachian regions should also be preserved; and they cannot be unless the people of the States in which they lie, through their representatives in the Congress, secure vigorous action by the National Government.

HAWAII.

The needs of Hawaii are peculiar; every aid should be given the islands; and our efforts should be unceasing to develop them along the lines of a community of small freeholders, not of great planters with coolie-tilled estates. Situated as this Territory is, in the middle of the Pacific, there are duties imposed upon this small community which do not fall in like degree or manner upon any other American community. This warrants our treating it differently from the way in which we treat Territories contiguous to or surrounded by sister Territories or other States, and justifies the setting aside of a portion of our revenues to be expended for educational and internal improvements therein. Hawaii is now making an effort to secure immigration fit in the end to assume the duties and burdens of full American citizenship, and whenever the leaders in the various industries of those islands finally adopt our ideals and heartily join our administration in endeavoring to develop a middle class of substantial citizens, a way will then be found to deal with the commercial and industrial problems which now appear to them so serious. The best Americanism is that which aims for stability and permanency of prosperous citizenship, rather than immediate returns on large masses of capital.

EUCALYPTS FOR TIMBER.

In view of the prevalence of eucalyptus forests on Oahu the following bulletin of the U. S. Forest Service is of sufficient local importance to be reprinted in full:

The wood of eucalyptus has not been extensively used by manufacturers in the United States, because the supply has not been sufficient to establish a market. Blue gum, the most common species in California, has, however, competed with black locust for insulator pins, has given satisfactory service in chisel and hammer handles, and has been used locally for wagon tongues, axles, shafts, spokes, hubs and felloes. It is hard, strong and tough.

In coöperation with the State of California, the Forest Service recently completed a study of the mechanical and physical properties of the common eucalyptus. The tests, made at the State University at Berkeley, were to determine whether eucalyptus can be substituted for some of the hardwoods that are becoming difficult to obtain.

Blue gum is by far the fastest growing species. The height and diameter of trees from which the test places were taken, is given in the following table. All the trees were about fifteen years old:

SPECIES.

Common name.	Botanical name.	Diameter Inches	Height Feet
Blue gum.....	Eucalyptus globulus.....	30	101
Sugar gum.....	Eucalyptus corynocalyx..	15	73
Karri.....	Eucalyptus diversicolor..	16	72
Manna gum.....	Eucalyptus viminalis.....	12	60
Red gum.....	Eucalyptus nostrata.....	9	47
Leather-jacket...	Eucalyptus punctata.....	10	43
Red mahogany...	Eucalyptus resinifera....	8	38

An important point in considering the value of commercial plantations of eucalyptus is brought out in the second table, which shows that the fastest growing are also strongest.

TESTS.

Species	BENDING			COMPRESSION PARALLEL TO GRAIN	
	Age in years	Number of tests	Modulus of rupture lbs. per square inch	Number of tests	Crushing strength, lbs. per square inch
Sugar gum.....	15	5	25,344	11	11,290
Blue gum.....	30	12	23,265	15	12,310
Leather-jacket ..	15	3	19,267	10	10,908
Karri	15	8	18,386	17	8,795

Blue gum.....	15	28	16,900	34	8,190
Red Mahogany ..	15	4	14,550	2	7,920
Red gum.....	15	9	14,380	6	7,723
Manna gum.....	15	12	13,093	20	7,309

A comparison with Forest Service tests on hickory shows that 30-year-old blue gum is stronger than hickory, and that 15-year-old sugar gum is nearly as strong as black hickory and 91 per cent. as strong as second-growth hickory.

The wood of very young and sappy trees is apt to warp, but that from more mature growth can be easily handled to prevent warping. Early seasoning should proceed slowly. Open piling is desirable; the stacks should be high to secure weight, and should be covered.

Several of the eucalyptus grow rapidly in California, and, under forest conditions, form straight, tall boles free from branches. They have, therefore, especial value as timber trees.
—U. S. Department of Agriculture, Forest Service, Trade Bulletin 8.

U. S. FOREST SERVICE CIRCULARS.

The following particulars, as they possess some local interest, are quoted from recent circulars compiled by Mr. H. M. Hale of the U. S. Forest Service:

WOOD DISTILLATION IN THE U. S. IN 1905.

"The total consumption of wood used for distillation in 1905 throughout the United States was 676,739 cords, valued at \$2,010,611; and the products comprise 26,670,139 bushels of charcoal, 5,062,076 gallons of alcohol, 86,685,129 pounds of acetate of lime, 238,180 gallons of turpentine, and 1,039,980 gallons of tar and oil, besides 434,780 gallons of oil from pine distillation. The total for tar distillation from hardwood is very small. As a matter of fact, the figures do not even approximate the actual amount, but, instead, represent only the amount saved and refined. Owing to certain characteristics of the tar obtained from hadwoods, which make it of low commercial value, most of it is used for fuel, either in carbonizing the wood or in refining the liquor, and when so used no record is kept of the quantity produced."

WOOD USED FOR VENEER IN 1905.

"The absence of figures in the census reports shows that, down to 1900, veneering had not assumed the importance of an industry worthy of special attention. At the present time,

however, there are in the United States over 128 establishments which cut veneer, using annually more than 189,000,000 feet log measure, the equivalent of approximately 217,000,000 board feet, which yields 1,108,000,000 square feet of veneer. It is evident that the growth of the veneer industry has been strikingly rapid.

"Veneers are of three general classes—sawed, sliced, and rotary-cut. Sawed veneers, which have been longest used, are of highest grade. Sliced veneers rank next in order of quality. Although the returns from the manufacturers do not indicate the exact process, there is little doubt that 75 per cent. of the oak veneers are either sawed or sliced. The rotary process is very extensively employed for all woods except oak."

The importance of "Red gum" wood for veneering purposes is appreciable, as it furnished 21.8 per cent. of the raw material used. This is particularly important as the wood of this species has been utilized for this purpose for only a few years. Maple ranks second in quantity, furnishing 14.5 per cent. of raw material. Yellow poplar is the only other species furnishing more than 10 per cent. of raw material. The three species named furnished more than one-half of the total quantity of wood used. The data given is founded upon the statements of one hundred and twenty-eight manufacturers throughout the country. Among the woods used for veneer, besides the three above named, are included cottonwood, white oak, yellow pine, birch, basswood, elm, red oak, ash, walnut, beech, sycamore and tupelo, each of which furnishes its quota in the order named.

CONSUMPTION OF TANBARK IN 1905.

The statement of the consumption of tanbark in 1905 here given is based upon the reports of 222 firms operating 477 tanneries. The total amount of bark reported is 1,104,045 cords, of which hemlock constitutes 799,755 cords, or 73 per cent., and oak 304,290 cords, or 27 per cent. The average price per cord reported for hemlock bark is \$6.32 and for the oak bark \$10.44, making a total value of \$8,232,457.

The tanneries of Pennsylvania lead in the quantity of bark purchased, the total being 428,709 cords, of which 379,806 cords were hemlock and 48,903 cords oak. This is nearly double the quantity of bark purchased in Michigan, the State which ranks next in importance. Pennsylvania and Michigan are by far the largest users of bark, particularly hemlock, and together these two States purchased over 60 per cent. of the total quantity reported. In the purchase of oak bark Virginia holds first place with 73,871 cords.

Since tanneries are usually located in or near the regions

from which they draw their supply of bark, the assumption may fairly be made that, on the whole, the figures for purchases also represent approximately the production in the States mentioned. On this assumption, the leading States in the production of hemlock bark are Pennsylvania, Michigan, Wisconsin, West Virginia, Maine, and New York in the order named, aggregating 97 per cent. of the total production. Similarly, over 90 per cent. of the oak bark is produced by the following States: Virginia, California, Pennsylvania, West Virginia, Tennessee, North Carolina and Kentucky.

In addition to bark and chemicals, the tanneries use large quantities of extracts made from hemlock and oak bark and chestnut wood, together with a considerable amount of imported quebracho and gambier. Sumach leaves and plametto extracts are also used to some extent.

During the period which has elapsed since the Twelfth Census was taken the use of the extract of quebracho, a South American tree, has largely increased. Quebracho contains a very high percentage of tannin and gives excellent results when mixed with various quantities of domestic barks or extracts. This extract can be imported at a price which compares very favorably with the present price of domestic barks, and the drain on the supply of tanbark in the United States is thus considerably relieved.

NOTICE.

The annual meeting of the Farmers' Institute of Hawaii will be held at Kamehameha Boys' School, Honolulu, on Saturday, February 2, 1907.

The program will be as follows:

AFTERNOON SESSION.

- 2:30 p. m.—Business meeting.
Report of the Secretay-Treasurer.
Election of Officers.
- 4 p. m.—Inspection of the farm and shops of Kamehameha Manual Training School.

EVENING SESSION.

- 7:30 p. m.—Music.....Kamehameha Glee Club
Address of Welcome.....President P. L. Horne
Response and President's Annual Address.....
.....Mr. Jared G. Smith
Music.....Kamehameha Mandolin Club.

Observations on Some Hawaiian Crop Blights..
Dr. N. A. Cobb
Music.....Kamehameha Glee Club
The Camphor Industry.....Mr. L. G. Blackman

A cordian invitation is extended to all who are interested.

F. G. KRAUSS,
Secretary and Treasurer.

TITLE PAGE AND INDEX.

A Title Page, Index and Table of Contents to Volume III
is in preparation and will accompany the February number.

BY AUTHORITY.

APPOINTMENT.

Notice is hereby given that the Governor has, on the 4th instant, ap-
pointed Leonard G. Kellogg, Esquire, a Commissioner of Agriculture and
Forestry, for the term of five years.

A. L. C. ATKINSON,
Secretary of Hawaii.

Executive Building, Honolulu, January 8, 1907.

VOL. IV.

FEBRUARY, 1907.

No. 2.

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NOTICE FROM THE DIVISION OF ENTOMOLOGY

The Entomological Division of this Board wishes to inform Hawaiian readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER & AGRICULTURIST

VOL. IV.

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No. 2

In the face of the general advancement which has taken place of late years in the development of the Territory, it is at once extraordinary and unfortunate that the legislation of Hawaii leaves so much to be desired in the way of affording adequate protection to the family homestead. In this particular we are far behind our simple English ancestors, for by the early common law of England real property could not be taken upon execution for the satisfaction of creditors, but the latter could only have recourse to the debtor's goods and chattels and to the profits of his land. As time advanced, however, the demands of a developing civilization, in an age more crude and elementary in its conception of natural justice and equity than our own, permitted the real estate of a debtor to be attached, and eventually it even became customary to incarcerate his body until the claims of his creditors were fully paid. A more enlightened age has abated the excessive rigors of these laws, and not only in the United States but in England the debtor's prison is unknown. It is in the former country, however, that the solicitude of the state has been most paternally extended to the assistance of the unfortunate debtor, and in most, if not all of the States, statutes are in force which may to an extent be said to reinstate the debtor to the position he occupied under the early common law.

The statutes to which reference is made are known as Homestead statutes, and their object is to afford protection to the home and to the liberty of unfortunate debtors, and to safeguard their interests against the exacting claims of creditors. At the same time they afford an industrious and honest man upon whom financial misfortune has fallen, an opportunity to reinstate himself as a useful member of society. Their benefit is thus not for the debtor alone, but in protecting the individual the interests of the whole community are advanced. The Homestead laws are so interpreted as to carefully guard against their provisions being used as a shield against the payment of just debts by a fraudulent and unscrupulous debtor, and certain debts are specially excluded from the homestead exemption. Of these the claims of labor and material-men may be mentioned and the debts secured by mortgage on the homestead signed by both husband and wife.

Two classes of homesteads are known, one based on an area which differs for "rural" and "urban" lands. The latter,

being situated in towns are less extensive than the former which usually are of sufficient size to constitute a small farm. In the other class of homesteads the value only is the basis. In either case the statutes provide that the head of a family shall be allowed to preserve his home for the benefit of the family, free from the molestation of creditors. Restrictions are usually imposed as to the value and extent of the property exempted, and means are provided for subjecting the excess over the exempt value to the claims of creditors. In some States the property secured may be worth as much as \$5,000, although generally the amount is somewhat less than this. As a rule considerable latitude is given to the terms "head of a family" and "family." As used under the homestead statutes it is in general sufficient that there is a collective body of persons subsisting in common and presided over by one who owes to the others a legal or moral obligation of support, founded upon relationship rather than upon contract. The right of homestead in some States attaches not only to freehold estates but to every interest in land which may be subjected to debt. The property protected embraces the dwelling house and all the appurtenances necessary to the maintenance of a home. In some States the homestead privilege extends to all homes, but in others it is first necessary to fulfill certain legal formalities in order to derive exemption, called filing a claim of homestead.

Of all the United States and Territories Hawaii is probably most backward in adequate legislation upon this subject. At present the value exempted from forced sale is a house lot not to exceed one quarter of an acre with the dwelling house, provided the same does not exceed \$250 in value, and one-half acre of taro land, if actually cultivated for family use. (Sec. 1830 of Revised Laws, taken from Civil Code of 1859.)

In order to encourage the proper agricultural development of this Territory, one of the first essentials is to secure the enactment of a substantial homestead statute. The importance of this was shown in the Forester, two years ago, by Judge Weaver, who, in an able paper outlined the general statutes obtaining in the various States. It is to be hoped that the coming Legislature will take this matter seriously in hand, and will bring the Territory into line with the majority of the United States which have adopted beneficial homestead laws.

An agreement of sale was recently made with the approval of the Governor between the Commissioner of Public Lands and Walter McBryde, by which the latter will eventually become the owner of the Kukuiolono lot of the Kalahea land, Kauai. The contract is conditioned besides the purchase

price by the agreement that the grantee plants thirty thousand trees on the land, at the rate of three thousand a year, and at the expiration of ten years the government delivers a deed to the property.

The purpose of the sale is primarily to conserve the water supply, by reforesting a bare hilltop which at one time possessed an abundant natural herbage.

Walter McBryde has for some time past taken an active part in forestry work on Kauai and was one of the first in the Islands to recognize the immense value of preserving the forests of our watersheds, and to actively undertake in their conservation. The rehabilitation of Kukuiolono with forest trees will entail much labor, but its successful accomplishment is greatly to be desired.

One of the features of the lava ejected by the recent volcanic outbreak in south Hawaii has been the presence of numerous particles of olivin. Crystallized silica occurs in many of the former lava flows of the Hawaiian Islands, and generally is found in the form of the well known olivin. This stone belongs to the chrysolite group of minerals and is a frequent constituent of volcanic and meteoric rocks. It is of some commercial value when occurring in sufficiently large and good chrystals. It is known in France as the "peridot," under which name it figures in jewellers' catalogues. The Hawaiian olivins are generally of very mediocre quality and of insufficient value to repay collection. They are also said to possess an additional disadvantage of undergoing rapid deterioration. Although usually quite small, many of large size have been found, notably on Hawaii. This mineral possesses great hardness and may be observed in the matrix even while the latter is in a semi-molten condition. The minute size of the specimens thrown up by the present outbreak, indicates that the flow has issued from no considerable depth.

In response to numerous requests, and in view of the developing interest in the cultivation of vanilla, we are arranging to publish in the Forester the salient features of Bulletin No. 21, of the U. S. Department of Agriculture, Division of Botany, entitled "Vanilla Culture, as practiced in the Leychelles Islands." The publication is by S. T. Galbraith, and is now unobtainable. It contains a review of the cultivation of vanilla and gives practical directions for starting a vanillery. The illustrations showing the method of artificial pollination are of great use. The bulletin has been loaned for reproduction in the Forester by the Superintendent of Forestry.

A general falling off of the value of exports of American cotton cloths to China during 1906 is reported by the Bureau of Statistics of the Department of Commerce and Labor. It is believed that this condition was due to over importation of cotton goods into China during the previous year. Some anxiety had been felt in the United States in consequence of this diminution but it now appears, in addition to the former overstock that the reduction in the imports by China is general and is not aimed exclusively at American products.

The total trade of Great Britain for 1905 amounted to nearly five billion dollars, and established a new record. The wave of trade prosperity as shown by the above figures appears to have affected almost all branches of industry.

FARMERS' INSTITUTE OF HAWAII.

ANNUAL MEETING.

The fifth annual meeting of the Farmers' Institute of Hawaii took place at the Kamehameha Boys' School on Saturday, February 2, 1907. An attractive program had been arranged by the Secretary, but owing to the continuance of the inclement weather which had prevailed of late, the attendance was sparse and the exercises were much curtailed.

I. AFTERNOON SESSION.

The day's proceedings commenced at 3 o'clock, when the meeting was called to order by the President, Jared G. Smith. The annual report and the financial statement were first read by the secretary-treasurer, and accepted. A copy of these will appear in a subsequent number of the Forester.

The President then reported the action of the Institute with reference to the recent agricultural exhibition, and expressed himself satisfied that the results which had been achieved fully justified the part which the Institute had taken.

It was stated by the secretary-treasurer that, owing to the limited time at his disposal, he had been unable to put into effect the preparation and circulation of a letter to members and to others interested in the society, bringing before their notice the necessity of rendering more stable the financial condition of the Farmers' Institute. The regular payment of annual dues would do much to increase the effectiveness of the work which was often hindered for lack of outstanding fees. Of the one hundred persons addressed, twenty had responded.

ELECTION OF OFFICERS.

The election of officers for the ensuing year now took place, and the following were again nominated and unanimously elected to serve in their respective capacities for another year:

President Jared G. Smith
Vice-President Wm. Weinrich, Jr.
Secretary-Treasurer F. G. Krauss

Messrs. Perley L. Horne, Sweezey and S. Parker were elected Executive Committee for the year.

Jared G. Smith stated that he considered the executive committee an important department of the Institute upon which responsible duties frequently devolved. He cited the instance which occurred last year in which the committee coöperated with the Delegate to Congress in an effort to secure to the Territory a tobacco expert from the National Department of Agriculture, and the organization of an efficient soil survey of the Islands. President Smith believed that both these requests would be acceded to when funds became available for the purposes referred to.

Mr. Horne moved that the Farmers' Institute again bring before the Hon. Secretary of Agriculture at Washington the importance to the Territory of the establishment of a soil survey and the appointment of an official thoroughly conversant in the cultivation of tobacco. The motion was seconded and carried.

It had been arranged to inspect the Kamehameha School farm, and the industrial shops of the manual training school, but the weather did not permit of this intention, and a most interesting part of the program had in consequence to be abandoned.

II. EVENING SESSION.

The evening proceedings commenced at eight o'clock. Mr. P. L. Horne, President of the Schools, extended the hearty welcome of Kamehameha Schools to the Farmers' Institute. He considered the Schools fortunate that the Institute should hold its annual meetings at Kamehameha, whose pupils received an agricultural training, and by the natural course of events, should become the future farmers of the Territory. The annual farmers' meeting at the Schools should do much to encourage and inspire those who were now fitting themselves to take their place in the domain of husbandry. He recognized the importance of the work which the Institute was doing, and wished that some way could be devised to bring its operations more clearly before the community. The best way to achieve this, he thought was for the Institute and all who were interested in the objects for which it was founded

to coöperate in an exhibition which would appeal directly to the interest of the public. The exhibition in which the Institute had lately taken part had no doubt been instrumental of many beneficial results, and should help to indicate the far reaching good to be gained by a wider effort at popularity. He would like to see established in Honolulu an annual county fair of the old New England type, in which every department of agriculture would find a fitting place. Such an exhibition should not be confined to the mere crops of field and farm, but should embrace such industries as bread and butter making. By this means the interest would be more general and the assistance of the ladies of the community would be invoked. This latter feature he considered of great importance in stimulating an interest in an annual agricultural exhibit, and in rendering it permanent.

Mr. Jared G. Smith, in response to Mr. Horne's address, spoke as follows:

PRESIDENT SMITH'S ADDRESS. •

On behalf of the Farmers' Institute of Hawaii, I wish to thank President Horne and his efficient corps of teachers and helpers for their hospitality. It is always an inspiration to me and I am sure also to all who are interested in things agricultural, to meet with you for our annual meeting and note the progress which each year of development shows. It is a pleasure to see so many young Hawaiians and to know that they are being so well trained in agricultural and mechanical lines so that they may meet the obligations which the industrial development of this Territory will impose upon them. The future of this country depends to a large extent on the young men and women now growing up and I am sure that if you will live up to the wise teachings of your teachers, you will attain the fullest measure of good citizenship.

It is fitting that at least once a year we should consider what has been accomplished toward the advancement of the cause of diversification of industries. In 1901, when I came to Hawaii to inaugurate experiment station work for the United States Department of Agriculture, there was only one string to Hawaii's bow. The idea that there was a possibility of developing new industries was scoffed at and I remember that almost every one told me when suggestions were made as to the possibility of producing this or that, that that was an impossibility as every one who had tried to grow anything but sugar cane had lost every cent they had put into it. Looking back over the last six years, I note many things begun as well as many things accomplished and best of all I note a decided change in sentiment on the part of a great

many people who were undoubtedly sincere in their belief that sugar was the only possible crop. As a matter of fact, there are so many things that I hardly know where to commence and shall have to content myself with a mere enumeration.

Pineapples. Five canneries are now in operation and others are in process of construction whereas, in 1901, there was only the single cannery of the Pearl City Fruit Company. The capitalization employed has increased to over one million dollars, and as an illustration of the growth of this industry you will be interested to know that one of our new plantations is the largest in acreage and number of pines planted, in the United States. The shipment of fresh pines amounts to over ten thousand dollars annually and is capable of much greater extension.

Sisal. The beginning of the sisal industry dates back about fifteen years but has only become prominent within the last three years. It now ranks as one of the established industries and has only begun its full developmental period. Hawaiian sisal fiber has been pronounced not simply the equal of the best Yucatan but very superior to it, and the prices realized for it and the demand which is developing, promise to place our sisal fiber on a par in the world's markets with the best Manila hemp.

Tobacco. Experiments with tobacco have been carried on for four years and the 1906 crop grown by the Hawaii Experiment Station has been pronounced by all who have examined it, of very fine quality. There are a good many thousand acres of land in Hawaii capable of producing this weed and I want to say right here that tobacco countries are rich countries the world over. Tobacco may be an enemy of mankind, a luxury and to some extent a poison, but the development of a tobacco industry in a country demands a stable population. There is a good deal of "know how" required and it is not the kind of know how that can be readily transmitted to a class of laborers who are here today and there tomorrow. Skill and knowledge are essential to the production of good leaf and I am firmly convinced that the development of a tobacco industry in Hawaii will do its share towards giving these Islands a better class of population than has been considered necessary for the cultivation of sugar. Because of the value of the crop it is a small man's industry and I believe that our Hawaiian boys could with profit to themselves, take up tobacco cultivation.

Rubber. The cultivation of rubber producing trees has been entered into on all of the larger islands of the group and some of the trees are almost up to the bearing stage. Rubber cultivation in Hawaii has every promise of becoming an extremely profitable industry and this crop, like tobacco, is cap-

able of profitable development by small men or on a small scale.

Insect Control. Rapid strides have been made in the scientific control of injurious insects by the natural method, that is, the introduction and propagation of parasites; and by the method of direct control through the use of contact and internal poisons. Another striking example of insect control is the successful introduction into Hawaii of the top-minnows, small fish which feed upon the mosquito larvae. The whole subject of mosquito control in Hawaii dates back only four years.

Plant Breeding. A number of lines of plant breeding have been begun, notably the creation of new varieties of sugar cane and of new and improved strains of rice. This work is of necessity slow, especially with tropical plants which require many years to attain their fruition, but the results when obtained are vastly beneficial to the agricultural and horticultural industries.

Plant Diseases Control. The magnificent work of Drs. Cobb and Lewton-Brain on the diseases of cane and other cultivated crops is known to you all. The inauguration of these lines of agricultural work in this Territory marks a new era and is bound to prove vastly beneficial to every agricultural industry.

Animal Diseases. Of equal importance is the work being done in the control and eradication of animal diseases. Within three years glanders, one of the most serious contagious diseases of horses and mules, has been brought almost under complete control, and Dr. Norgaard's discoveries in regard to the function of lime as an animal food is of inestimable value to the stock industry.

Silk. Three separate demonstrations have been made of the practicability, and profit to be derived, from the cultivation of the silk worm and the mulberry. This is an extremely intensified industry which must be considered in relation to attaching a permanent population to the land.

Quarantine. Another material advancement is the establishment of a rigid quarantine against the introduction of dangerous insects and plant diseases from foreign countries.

Forestry. While much forestry work has been done in Hawaii for twenty years or more, it has only recently crystallized itself into a bureau of practical forestry. The establishment of forest reserves and their scientific planting with useful trees is a development of which Hawaii may well be proud. I believe that there is no other State or Territory which has done more or even as much, within the short time during which the forest service has been in operation.

Honey. The bee-keeping industry has developed remarkably within the last five years. The capitalization has been

quadrupled and the production increased in greater ratio, and I believe that we know more about the sources and composition of Hawaiian honeys than they do in most of the mainland States of their own product.

Fruit Shipments. A careful and detailed study has been begun of the difficulties attending the shipment of fresh fruits to the mainland markets. Our Hawaiian fresh fruit trade amounts to over one hundred thousand dollars per annum and is capable of indefinite extension and incidentally the employment of many farmers in its production. It has been demonstrated that there is a good market for papayas on the Pacific Coast, and I believe that the production of this wholesome fruit for shipment is going to be a big industry in these Islands.

This list might be almost indefinitely extended. I have not touched on the matter of fertilizer experiments, irrigation experiments, or the cultivation of many crops such as vanilla and the rosella.

I think that the Farmers' Institute is entitled to congratulate itself on account of its successful agricultural fair held in coöperation with the poultry men's association, and I hope that each year will see a bigger and better exhibition of Hawaiian products.

These are in part, the results of six years work by three scientific institutions, the H. S. P. A. Experiment Station, the Hawaii Experiment Station and the Board of Agriculture and Forestry. As to the exact cost of the work I do not know but I am sure that the amount expended represents only a very small percentage of the whole financial results. Taking the cost as \$100,000 per annum, I believe that no other hundred thousand dollars expended from public or private revenues has yielded larger money returns.

The developments outlined as a part of the result of six years work are good and I know that if the people of Hawaii will continue their support they will be better as each year progresses, but there is still one side where Hawaii is weak. The logical outcome of this active scientific investigation must be the establishment of an agricultural college, an institution for the training of men to do this kind of work. I believe that you will all acknowledge that the work already done is good. I believe that the people of Hawaii will heartily support an effort on the part of the coming legislature, to round out a complete and proper development of scientific agriculture in Hawaii by the establishment of a well endowed institution which shall teach young men and young women not only how to become scientific investigators, but to be able to support themselves and add to the wealth of Hawaii by direct application of their knowledge to the soil.

At the conclusion of Mr. Smith's address, Dr. N. A. Cobb gave a most interesting illustrated lecture entitled "Observations on some Hawaiian crop blights." This, together with Mr. L. G. Blackman's paper on the camphor industry will appear in another issue.

IMPORTANT PUBLICATIONS.

COMMERCIAL ATLAS.

Atlas of the World's Commerce, a new series of maps with descriptive text and diagrams, showing products, imports and exports, commercial conditions and economic statistics of the countries of the world. Compiled from the latest official returns at the Edinburgh Geographical Institute and edited by J. G. Bartholomew, F. R. S. E., F. R. G. S.

Few recent publications are of such exceptional interest to the agriculturist or to the merchant as the *Atlas of the World's Commerce*, the early numbers of which have recently been received. The atlas presents the whole question of the world's products, imports and exports, with impartiality and exactness and although published in England, undue prominence is not accorded to the claims of the British Empire. From the merchants' point of view the world constitutes one vast commercial exchange. Every country to some extent relies upon the imports of other countries, and no country in itself is commercially independent. In this proposition is found the basis of the world's fiscal question.

The chief object of the compilers of the *Atlas* is to present by a series of large, self-explanatory maps the principal sources of the articles of commerce. In this manner is afforded a key to the merchandise of the world and a summary of its material resources. A brief examination of the map which is devoted to the production of coffee offers an illustration to the scope of the work. In this case a map of the world is presented, upon which the coffee growing countries are colored red, the tint being proportioned to the quantity of production. Upon the same map, the coffee importing countries are represented in blue, those of large consumption, that is, where over six pounds per head per annum is used, being colored darker than those of smaller consumption. The chief lines of export are also shown in bold outline. Arranged on the same page, are smaller maps exhibiting the similar local conditions in countries figuring largely in coffee production, such as Brazil, Java, and the West Indies. The whole set of maps devoted to coffee form a complete exposition of the present question of demand and supply of this product. By means of devoting a separate plate to each important article

the commerce of the world is graphically illustrated. The first twenty-one plates are used to set forth the general physical, political and economic aspects affecting the subject treated of. Ten plates are devoted to communication and transport, and about twenty-five to regional maps showing industrial areas, routes of commerce, vegetation and general products. Nearly fifty plates exhibit the distribution of food products; fifteen the distribution of textile materials; and twenty-five, the distribution of mineral products. The following miscellaneous products are also given special plates: India rubber, 3; Timber and Cabinet woods; Tobacco, 4; Ivory, Gums, Resin and Wax; Vegetable oils; Opium; Fish oils; Hides and Skins; and Dyeing materials. Altogether one hundred and seventy-six large pages of colored plates are given, containing more than a thousand maps and diagrams. The plates are accompanied with descriptive text, which is practically a dictionary of the commerce of the world. The material embodied in the Atlas is compiled from many hundred trade returns and commercial reports from all countries of the world. The work is one of great importance and should be of great value, not only to those interested in agriculture but as a work of reference in private and public libraries. To the merchant its merits are unquestionable.

The Atlas is issued at a total cost of about three dollars, in 22 periodical folio parts, issued fortnightly. It is to be obtained from Messrs. Frederick Wane & Co., New York.

RUBBER LITERATURE.

The Ceylon Rubber Exhibition, Colombo, September, 1906. Lectures and Discussions on Rubber Cultivation and Preparation. Illustrated. Messrs. A. G. & J. Ferguson, Colombo, Ceylon. 4 shillings.

This publication will be found of great interest to the growers of rubber in Hawaii. The plantation rubber industry of the East Indies is of comparatively recent origin, and its rapid development during the last five to seven years is one of the most wonderful achievements of tropical agricultural history. The first attempt at introducing the industry in Ceylon was in 1876, but the planters did not at first show much interest in the project. The Botanical Department of Ceylon, India, and The Straits Settlements, however, foreseeing the future of the new undertaking, steadily proceeded to propagate and distribute the plants and although the value of their work was not at that time fully realized it is from these sources that we are indebted for much of the present knowledge of the subject.

Not until the failure of coffee in Ceylon did the few planters who remained in the colony turn their attention to rubber. The Manihot (Ceara) was the first species tried, but the yield from the tree proving disappointing many thousands were ruthlessly cut down and preference given to the Hevea. The destruction of the Manihot species and the prejudice which arose against it is to be regretted as it is now grown in Ceylon with satisfactory results.

After a brief history of the rubber industry in Ceylon, the book we are considering gives a general account of the successful exhibition of rubber products which has recently been held in Colombo. It is, however, the Lectures and Discussions which took place during the course of the exhibit which is particularly interesting to Hawaiian readers. These form the greater portion of the volume and their scope is sufficiently important to give their table:

Rubber and Coffee in Ceylon, by Dr. J. C. Willis.

Rubber in Southern India, by E. G. Windle.

Rubber Cultivation and The Future Production, by G. H. Wright.

Rubber Vulcanization, by Kelway Bamber.

Rubber Insect Pests, by E. E. Green.

Prevention of Fungus Diseases of Rubber, by G. T. Petch.

Camphor and its Distillation, by G. Bamber.

Relative Qualities and Different Grades, by S. Brett.

The Preferred Forms of Plantation Rubber, by C. K. Smithett.

Rubber in the Malay Peninsula, by C. B. Carruthers.

Rubber Shipment to London, C. G. Devitt.

Tobacco Cultivation in Sumatra.

During the course of the exhibition a practical demonstration of the whole process of rubber manufacture from the tree to the blocked product ready for export, was given. The demonstration proved a specially appreciated part of the undertaking. Practical methods of tapping were also shown to a large gathering of planters by Mr. Herbert Wright, Controller of the Government Experiment Station at Peradeniya, who conducted parties around the gardens, making explanations, answering questions and giving practical demonstrations.

We recommend the perusal of this book by all interested in the development of the rubber industry.

TITLE PAGE TO INDEX.

The Title Page and Index to Vol. IV are still at press and will be issued as soon as possible.

THE MANGOSTEEN.

To the Editor of the Forester and Agriculturalist.

Dear Sir:

It will doubtless be of interest to many of the readers of your paper to learn that another tree of the *Garcinia Mangostana*, or true Mangosteen, has been located growing in the gulch near the home of Mr. George Wilcox, at Lihue, Kauai. Not long since Mr. Wilcox sent to me some of its leaves for identification and, although the tree has never fruited there is no doubt in my mind that it is a true mangosteen, and was probably planted at the same time as those now growing in the premises of Mr. Francis Gay of Kauai, and Mrs. Horner of Lahaina, Maui.

Yours truly,

GERRIT P. WILDER.

OAHUS FOOD RESOURCES.

The following from the Pacific Commercial Advertiser of January 31, is of interest as showing the latent possibilities of this island to develop its potential food resources, if subjected to a long period in which it could depend upon no outside supplies:

"It is not beside the mark to say that if the population of Oahu were subjected to a blockade, it could keep its market supplied with a larger and fresher variety of food, with the exception of fresh beef, than it has now. In such a case everybody would raise something to eat and make a business of it and Pearl Harbor would be drawn upon, as never before, for fish. Take vegetables, such as the Chinese, Japanese and Portuguese cultivate now; the area of their production would be indefinitely added to. Taro and rice-planting, honey-making, duck, pigeon, poultry and hog-farming, sheep and cattle-raising on the high hills, banana culture—all these things would be prosecuted with an energy and zeal which would make Oahu the best fed spot of the Pacific. Haphazard methods of production, say in the poultry business, would disappear under the system which a common need would impel. Science, released from its sugar studies for the time being, would turn to the eradication of general insect pests; small manufactures would spring up and we should make condensed milk, conserves, raise and prepare our own tobacco, produce silk, cotton and to some extent hempen cloth—perhaps by crude methods, but nevertheless. There is no end to the things that could be done here to keep the population well

fed and tolerably well clad if necessity, the mother of invention, were to be invoked."

The Forester heartily agrees with the possibility of agricultural development outlined above and foresees the time when such a condition of affairs will have been brought about, not by the pressure of external force, but by the natural expansion of her industries. With regard to the allusion to the scientific control of insects, it may be of interest to say that of the three scientific institutions at work in Honolulu in economic entomology, only one is engaged primarily in the suppression of insects affecting the sugar crop. The one alluded to, moreover, is a private one maintained by the sugar planters themselves. Its entomological work although in the main devoted to the protection of the industry, on whose prosperity it owes its own *raison d'être*, also embraces entomology generally. The entomological work of the Federal Station, and of the Territorial Bureau of Agriculture is chiefly directed to the eradication of such pests as affect the citrus, alligator pear, mango, and other fruit crops, and other enemies attacking plant life generally. The ability of the sugar planters to protect their own interests in this matter is thus a direct benefit to the community at large, as it allows the entomologists of other institutions to devote their whole energy to pests and blights more nearly affecting the welfare of private residents.

NEW FARMERS' BULLETINS.

The following publications have recently been issued and may be obtained free from the Secretary of Agriculture, Washington, D. C.:

Management of Soils to Conserve Moisture, with Special Reference to Semiarid Conditions. By George H. Failyer, of the Bureau of Soils. Pp. 32, figs. 7. (Farmers' Bulletin No. 266.)

Directions for the cultivation and management of different soils, drainage of wet lands, preparation of seed beds, etc., with suggestions as to crops suitable for semiarid regions.

Experiment Station Work, XXXVII. Compiled from the publications of the Agricultural Experiment Stations. Pp. 32, fig. 1. (Farmers' Bulletin No. 267.)

Contents: Breeding corn—Buckwheat—Sugar beets on alkali soils—Alfileria as a forage plant—Apple bitter rot—Grass mulch for orchards—Hardiness of young fruit trees—Protecting cows from flies—Effect of silage on milk—Cold storage of cheese.

Industrial Alcohol: Sources and Manufacture. By H. W. Wiley, Chief, Bureau of Chemistry. Pp. 47, figs. 10. (Farmers' Bulletin No. 268.)

This bulletin is issued in response to the numerous inquiries sent to this Department regarding the manufacture of industrial or denatured alcohol, and contains the Federal law relating to its manufacture and use, the sources from which it may be obtained, and methods of manufacture.

Industrial Alcohol: Uses and Statistics. By H. W. Wiley, Chief, Bureau of Chemistry. Pp. 32, figs. 10. (Farmers' Bulletin No. 269.)

This bulletin gives a number of uses of industrial or denatured alcohol, especially those of direct interest to the farmer; also statistics on its production in the United States, Great Britain, France, and Germany. It is designed to supplement Farmers' Bulletin No. 268.

Modern Conveniences for the Farm Home. By Elmina T. Wilson, formerly Assistant Professor of Civil Engineering, Iowa State College. Prepared under the direction of the Office of Experiment Stations. Pp. 48, figs. 26. (Farmers' Bulletin No. 270.)

Suggestions and directions for installing in the farm home modern plumbing, heating plants, and lights, and for disposing of the wastes and sewage, with plans and illustrations of buildings and grounds.

A Successful Hog and Seed-corn Farm. By W. J. Spillman, Agriculturist in Charge of Farm Management Investigations, Bureau of Plant Industry. Pp. 16, figs. 5. (Farmers' Bulletin No. 272.)

This bulletin explains the system of management of a farm of 100 acres devoted to raising hogs and growing seed corn. It gives the feeding value of the different crops grown, care and feeding of pigs and hogs, and the average yearly outlay and income.

Experiment Station Work, XXXVIII. Compiled from the publications of the Agricultural Experiment Stations. Pp. 332, figs. 4. (Farmers' Bulletin No. 273.)

Contents: Loss of nitrogen from soils—Manure as affected by food—Continuous corn culture—Pasturing wheat—Storage of sweet potatoes—Rotting of potatoes in storage—Hog cots—The disinfection of stables—The effect of horsetail weeds on horses—Treatment of calf scours—Preserving eggs—Wheat bran—Testing individual cows—Clean milk—Cleanliness in the dairy—Grading cream—Paraffin in dairying.

PASPALUM THE MONOPOLIST.

It is all or nothing with paspalum. The big coast grass is an uncompromising monopolist. So far as experience on the Richmond goes, no other grass has a chance of living with it. Clover, prairie, lamb's tongue, rye, and others have been completely ousted from paddocks to which the paspalum has been introduced, and there are many dairymen who declare that even buffalo and the despised Paddy's lucerne cannot live against it. This is all the more extraordinary when one considers the great feeding qualities of paspalum. It naturally gives the best bucket results when it is of moderate growth, but even after it gets away feet high to seed it is relished and eaten low by stock. In the later stages, however, it tends rather to make beef than milk, and dairymen prefer to keep it in bounds. Within the past few years its spread on the Richmond has been prodigious, and how much the ever-advancing output of butter is indebted to it would be difficult to estimate. It is not that many other grasses don't do well on the coast, but that the paspalum comes strongest when the others, with the exception of the summer couch, are feeblest. It breaks away with the spring, and growing more like a well-cultivated field of green wheat or oats than ordinary grass, it continues to yield profusely all the summer. Of course, it wants rain, but still it can make a heavy growth on moderate falls, provided they are frequent. It solved for the coast the question of a permanent supply in normal seasons of natural feed, for there are other grasses to keep stock moving, if not in full profit, during the winter.

Its spread has been extraordinarily rapid, and is still proceeding, and most River farmers are its sworn friends. But there are those who dislike it because of its greed. They see a day not far distant when paspalum will be the sole grass of tens of thousands of cows on the Richmond, and prophesy that such a position will not be in the interests of dairying. They argue that the cow confined to one article of diet is as likely to get out of gear as the man who is expected to live on porridge and so draw dismal pictures of the future. The argument is hardly a sound one, because the cow after all only varies her diet from one grass food to another, and the variation in the properties consumed would probably be slight. Nevertheless it is one of the first principles of sound stock-raising that fresh pastures and grasses are of the utmost value, and no one who had the choice of an all-paspalum diet for his herd and a diet of mixed grasses would be likely to choose the former. Those dairymen are probably following the wisest course who are keeping the big grass off at least a portion of their farms, and thus maintaining a change of pastures.

How long they will be able to do this is doubtful, as the paspalum does not wait to be hand-seeded, but is always widening its own domain. Men who have gone the whole way on paspalum argue that it can easily be ploughed out. Certainly the roots when eaten low can be turned over, but the operation is followed by a vigorous growth of seedlings, which take a heap of controlling. That is on the flats. On a lot of the rough steep country, where the paspalum is so much at home, the difficulty is intensified, and the grass doubly secure. But so far there is not much ground for apprehension. Cattle show no signs of sickening of the grass and the returns from it are of the best. And there appears no reason why this should change. Paspalum has now been in this country for a number of years, and may be said to have passed a fair trial. Probably what will happen is that so rank a grower will in time exhaust even such rich country as the best areas of the North Coast, although the presence on land of a beast to the acre is a big source of improvement. If the land does go off, dairymen will have to give more attention to changing and cultivation, and perhaps fertilising with special chemicals.—Sydney Morning Herald, Nov. 21, '06.

WAHIAWA AND PINEAPPLES.

The following data are from information collected by C. Elschner, C. E., F. H. C., Chemist.

Wahiawa pines are far superior in aroma and sweetness to Florida fruit.

Demand is likely to exceed supply for many years.

Three canneries are in operation.

The Wahiawa soil is chiefly decomposed lava, but it varies considerably.

In regard to color of the soil, red, black, brown and greyish blue varieties are frequent.

The red soil is decomposed lava, poor in mineral plant food.

The black soil, though rich in ammonia, does not show the expected results in the development of growth. This may be due to the high percentage of manganese which it contains.

Soils formerly covered with guava scrub are generally not best suited to pines.

Algaroba, glue, and leguminous plants, which indicate the presence of a certain amount of lime are considered good predecessors of pines.

Although fertilization of the Wahiawa soil is not at first absolutely essential, it is advisable to enrich it from the first, in order to prevent exhaustion.

HAWAIIAN NAVEL ORANGES.

FINE RESULTS PRODUCED AT KAUMANA BY CAREFUL CULTIVATION OF TREES.

The first of this year's crop of Hawaiian navel oranges came from Kaumana last week and appearance as well as the flavor of the fruit speak well for the chance that it has to gain a place on the market. It will be remembered that last year the fruit was a disappointment. Its flavor was good but the size was far too small to command attention. An experiment was tried this year, certain trees being picked out and fertilized while others were left unfertilized. The fertilization produced marked results, for the trees so treated have produced fruit fully equal to any that California can show while the other trees gave the same small fruit of last year. With this encouragement a large number of new trees have been planted.—Hilo Tribune.

*UNITED STATES DEPARTMENT OF AGRICULTURE,
IRRIGATION AND DRAINAGE INVESTIGATIONS
OFFICE OF EXPERIMENT STATIONS.*

Washington, D. C.

BULLETIN NO. 173, THE EVOLUTION OF CORN-HARVESTING MACHINERY.

By C. J. Zintheo.

In the principal corn growing regions of the United States, as a rule only the grain is harvested, the stalks being left in the field to be eaten by live stock, or raked and burned. This bulletin describes the various machines which have been developed for harvesting the corn plant and preparing it for stock feed. It gives statements of cost, the length of service which may be expected under ordinary conditions, and the work which can be done with the various machines.

Application for this bulletin should be made to the Director of the Office of Experiment Stations, Washington, D. C.

PORK-PRODUCING FOODS.

According to an exchange, the Wiltshire (E.) county council carried out recently some pig feeding experiments which are of an extremely interesting and instructive nature. The dry feed was soaked over night, at the rate of a peck to five gallons of water, except when milk was used, when it replaced its own volume of water. The potatoes were boiled, and the foods were not given them in a sloppy condition. Appended are the points given to the different feeds:

- (1) Barley meal, milk, potatoes, 1,000 points.
- (2) Barley meal and milk, 903 pints.
- (3) Maize meal and milk, 877 points.
- (4) Maize meal and bean meal, 590 points.
- (5) Barley meal, 519 points.
- (6) Maize meal and pea meal, 489 points.
- (7) Maize meal, 484 points.
- (8) Barley meal and bran, 409 points.
- (9) Maize meal and bran, 404 points.

The most suitable meat for bacon production was obtained from barley meal and bran. Maize alone was found to produce excessive fat.—Journal of Agriculture. W. A.

WHITEWASH THAT WILL NOT RUB OFF.

A first class whitewash is made by dissolving 2 lbs. of ordinary glue in 7 pints of water, and when all is dissolved, adding 6 oz. of bichromate of potassium, dissolved in a pint of hot water. Stir the mixture up well, and then add sufficient whiting to make it up to the usual consistency, and apply with a brush in the ordinary manner as quickly as possible. This dries in a very short time, and, by the action of light, becomes converted into a perfectly insoluble waterproof substance, which does not wash off even with hot water, and at the same time does not give rise to mould growth, as whitewash made up with size often does. It may be colored to any desired shade by the use of a trace of any aniline dye or powdered coloring, while by the addition of a small proportion of calcic sulphite its antiseptic power is much increased.—Queensland Agricultural Journal.

BY AUTHORITY.

BRUSH FIRES ON TANTALUS.

Notice is hereby given that in accordance with Section 6 of Act 71 of the Session Laws of 1905 it is forbidden to start fires for the burning of brush, dry grass, etc., for a period of twelve months (12) from date, within that portion of the District of Kona, Island of Oahu, lying between Manoa and Pauoa Valleys, above the makai edge of the Eucalyptus forest, the Makiki reservoir and the foot of Round Top, unless the written permission of the District Fire Warden has been first obtained. The law reads "such fires shall not be started during a heavy wind or without sufficient help present to control the same, and the fire shall be watched by the person setting the same, or by competent agents of his, until put out."

The District Fire Warden is Mr. Walter M. Giffard.

RALPH S. HOSMER,
Chief Fire Warden.

Honolulu, T. H., Feb. 9, 1907.

THE FUTURE OF HAWAII.

The following communication from O. P. Austin, Chief of the Bureau of Statistics of the Department of Commerce and Labor, Washington, is sufficiently interesting to our readers to reproduce in full:

DEPARTMENT OF COMMERCE AND LABOR, BUREAU OF STATISTICS, WASHINGTON.

January 30, 1907.

Dear Sir: I beg to express to you my thanks for the map which you send me, entitled "Crossroads of the Pacific." It is a very interesting and striking presentation of the importance of Hawaii to the commerce of the Pacific, and of the commerce of the Pacific to Hawaii; and whether we consider it in the first mentioned light, of the importance of Hawaii to Pacific commerce, or in the second, of the importance of the Pacific commerce to Hawaii, we can but see in it a bright future for the Hawaiian Islands and their people. That the commerce of the Pacific is sure to grow in the immediate future more rapidly than that of any other ocean section of the world is generally conceded and indeed can not be doubted when we take into consideration the prospect that we shall within a few years open a new door to that greatest of oceans, the door of the Panama canal. Not only is it the greatest of oceans, but it furnishes the highway for interchange between great sections of the world which are mutually interdependent, and in those interchanges Hawaii can but profit as the great central station, the crossroads, as your map very aptly puts it, of the various highways connecting Asia and Oceania on the one hand with America on the other, and when the Panama canal shall be opened, with Europe also.

But there is another thought which I want to take this occasion to express, and that is that the true prosperity of Hawaii lies, in my opinion, in the development of highways in the interior of the islands rather than highways on the ocean. By this I mean that the greatest prosperity which could come to your islands is through an opening up of the interior and such diversification of industries and producing power as would be possible under such conditions. A section able to produce such a variety of tropical articles as may be produced in the Hawaiian Islands, and having free access to a market demanding such enormous quantities of those various articles as does the market of the United States, ought to become not merely prosperous, as it already is, but one of the most prosperous and perhaps the most prosperous of all the tropical communities of the world. With the power to produce sugar, of which the United States imports more than one hundred million dollars' worth a year; with the power to produce coffee, of which we import from seventy-five million to one hundred million dollars' worth annually; with the power to grow rubber, of which we import fifty million dollars' worth annually; with the power to produce tropical fruits, of which we import thirty-five million dollars' worth annually; with the power to produce sisal, of which we import fifteen million dollars' worth annually; and with the power to produce cocoa, of which we import nearly ten million dollars' worth annually, the possibilities of increased prosperity in Hawaii seem to me very great, and if you can bring about a development of "crossroads" in the interior of your islands, as commerce has already made those islands the crossroads of the ocean, you will see a still further improvement in that wonderful prosperity of which we are, all of us so proud.

Very truly yours,

O. P. AUSTIN, Chief of Bureau.

Mr. H. P. Wood, Secretary, The Hawaii Promotion Committee,
Honolulu, Hawaii.

VOL. IV

MARCH, 1907

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform Hawaiian readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER & AGRICULTURIST

VOL. IV.

MARCH, 1907

No. 3

The work of Dr. N. A. Cobb at the H. S. P. A. Experiment Station is likely to prove of great value to the agricultural industries of Hawaii, and the Territory is extremely fortunate in having the opportunity to benefit by the knowledge of such an authority on plant pathology. Dr. Cobb will remain in the islands until June 30, during which time he will be actively engaged in determining the plant diseases which have become established here. At the expiration of this period he will proceed to Washington, and will take with him such material as he has not opportunity to work up in Honolulu. An excellent occasion is now afforded to get plant diseases examined and reported upon, whether obscure and little known ones or those of more general prevalence. To this purpose Dr. Cobb has issued an invitation to all interested in the subject to forward to him specimens for examination. The importance to agriculture of a wide response to the circular, which appears in this issue, is very great, as the data gathered by this means will afford knowledge not only of the presence of various plant diseases, but will help to determine the range of their distribution and will form a basis for determining the best means to successfully combat them.

Upon his arrival at Washington, Dr. Cobb will assume control of the new office of Crop Technology, of the Bureau of Plant Industry, United States Department of Agriculture.

This number contains the first of a series of special articles on entomology, to be complete in four or five issues, by Mr. Jacob Kotinsky, of the Division of Entomology, Board of Agriculture and Forestry. Mr. Kotinsky has long been a regular contributor to our pages upon entomological subjects, but the articles now commencing are upon special matters, and the series will be complete in itself.

We have recently received from Mr. Jared G. Smith, a most interesting paper upon Cassava cultivation. Pia is a well-known Hawaiian food, and the product of cassava is also one of the chief comestibles of the inhabitants of the West Indies. Mr. Smith's article will appear in the next number.

ENTOMOLOGICAL NOTES.

BOARD OF AGRICULTURE AND FORESTRY.**Division of Entomology.**

BY JACOB KOTINSKY.

PRINCIPAL CITRUS INSECTS IN HAWAII.**INTRODUCTION.**

As yet these Islands can not boast of very numerous or very thrifty orange, lemon, or other citrus orchards with the possible exception of limes. Economic conditions have thus far barred the undertaking of citrus culture on a commercial scale. Citrus culture is nevertheless even at present a subject of no little importance on these Islands, to say nothing of its future prospects. Scarcely a door yard but is stocked with one or more trees of the citrus tribe. Though we do depend upon California for oranges and lemons to a considerable extent, our own supply fills an important place. But for an abundance of seed and not so attractive color, it is conceded that the native orange excels the imported article. In many Hawaiian homes the native orange is given first choice for private family consumption, although the Californian may be served in the presence of guests. Although not much in evidence in our markets at present, we feel keenly a scarcity of our native orange whenever it occurs. It thus becomes evident that by giving these trees the attention they require we should follow a wise course.

UNINTENTIONAL INSECT IMPORTATIONS.

Whatever the condition of our citrus plants years ago, they are at present beset with a number of foes, among which insects play an important part. Indiscriminate importation of plants from all over the world without inspection naturally led to the establishment of numerous pests. It is an established fact that all the insects affecting citrus plants in the Territory are of foreign origin. Practically all of them are of universal distribution, having followed the citrus plants about the world. Some of the insects are confined to certain citrus districts of the world. We may be consoled, perhaps, by the knowledge that many well-known pests of the citrus are not yet in the Territory, whether this absence be on account of unsuitable climate or other unknown causes. Our present system of rigid inspection of incoming vegetation promises to limit our citrus pests to what we have already acquired. And so long as this system is continued we may rest assured that no new pests will gain entry. This Territory and the State

of California are the only communities in the Union that pursue this policy of protection against foreign insect invasion. One can hardly explain why it is that the Federal government discriminates against plant life. While all possible precaution is taken by the U. S. Department of Agriculture to prevent the introduction and spread of parasites affecting man and his domestic animal, no such protection is extended our useful plants. Federal control of insect pests already established is now advocated. But why begin so late? Why not attack the evil at the root and forestall the introduction of foreign pests?

INTENTIONAL INSECT IMPORTATIONS.

During the past fourteen years the government of these Islands was busily engaged in the importation of predacious and parasitic insects, many of which are important enemies of some of our citrus insect pests. It is difficult to say what the fate of our citrus plants would have been without these, but the trained eye readily sees the amount of help rendered us by these six-footed friends.

CLASSIFICATION OF CITRUS INSECTS.

Before proceeding with the description of the various insect enemies of our citrus plants, it is advisable to acquaint the reader with a skeleton of the scheme of classification of the groups into which these insects fall. This grouping may be viewed from either the standpoint of their structure or that of the manner in which they do the injury. Generally speaking, insects injure plants, depending upon the structure of their mouth parts, either by biting portions of them, as do Japanese beetles and various caterpillars, or by puncturing the tissue and sucking up the sap. Arranging the insects according to their structure, notice is taken of the kind of mouths, i. e., whether sucking or biting, as well as the presence or absence of organs of locomotion—legs and wings—the number and texture of the wings, the difference between the sexes, etc. The economic importance of the nature of the mouth and the bearing it has upon remedial measures will be discussed later when remedies are considered.

(To be continued.)

*ANNUAL REPORT OF THE SECRETARY-TREASURER
OF THE FARMERS' INSTITUTE OF HAWAII.*

Mr. President and Members of the Farmers' Institute of the Territory of Hawaii:

With this annual meeting of the Farmers' Institute we complete the fifth year since its organization in January, 1902.

Since the last annual meeting, held at Kamehameha Schools, February 3, 1906, a regular quarterly meeting was held at the library of the Territorial Board of Agriculture on May 12, and a second regular meeting was held on September 29 at the same place.

The first meeting was given over entirely to the subject of coöperative marketing of Hawaiian agricultural products, under the following program:

1. Report of the Committee on Coöperative Marketing.
2. "The Necessity of Growing New Fruits in Hawaii," by Mr. William Weinrich, Jr.
3. "Some Advantages of Coöperative Marketing," by Mr. John Emmeluth.

President Jared G. Smith opened the meeting with an introduction showing the great benefits derived from coöperation elsewhere.

Interesting discussions followed the report of the Committee on Coöperative Marketing and the reading of Mr. Emmeluth's paper. General interest was evinced in the subject, and it is hoped good results will follow.

The September meeting was devoted to "Hawaiian Fruits and Their Culture." This neglected phase of our agricultural resources is so fruitful of development that our Institute may well give the subject increasing attention.

The program was as follows:

1. "Fruit Culture as an Industry in Hawaii" President Jared G. Smith
2. "Hawaiian Fruits" Dr. William T. Brigham
3. "Tropical Fruits as Food" Dr. Edmund C. Shorey
4. "Horticultural Insect Enemies" (Exhibition of Specimens) Mr. D. L. Van Dine

This meeting brought out a large attendance and much interest was shown in the subjects presented. A profitable discussion followed.

In November the Hawaiian Poultry Association invited the Farmers' Institute to make an agricultural exhibit in coöperation with their Second Annual Poultry Exhibition. Although the time available to plan such an exhibition was short, and

the time of year unseasonable for making a representative collection of agricultural products, the Farmers' Institute consented to take part and succeeded in getting together a small but creditable exhibit of fruits. The Hawaiian Agricultural Experiment Station and the Bureau of Forestry also made extensive exhibits.

(The classes under which the exhibits were entered, and the list of prizes offered, together with the names of the winners, have already appeared in the Forester and are therefore omitted.)

From the interest shown in this little exhibition and the expressions of commendation made at the time, it is believed the Farmers' Institute could extend its influence for the advancement of a better and more diversified agriculture if it would take the initiative in establishing an annual agricultural fair at a season when farm and orchard products are at their best. Such a fair should include exhibits of dairy products, livestock and agricultural implements, as well as the domestic arts and rural interests generally. Naturally, some time and expense would be attached to such an enterprise, but doubtless the various agricultural bodies would give freely of their time to such a work, and if the matter were rightly presented to the Legislature they, too, would no doubt make an appropriation sufficient to defray reasonable expenses. One or two thousand dollars per annum for this purpose would create a profitable promotion work at home and extend its influence well beyond our shores. Of the amount needed as stated above, about one-fourth should be set aside for cash prizes for best exhibits.

Acting upon a suggestion from our Delegate to Congress, which was presented before our last annual meeting, it was advised that a special meeting of the Executive Committee of the Farmers' Institute be called to consider the recommendations of Delegate Kalanianaole regarding the requests that soil surveys be inaugurated and a tobacco expert be provided by the U. S. Department of Agriculture for these Islands.

Accordingly, a meeting was called for February 13, which resulted in drafting two letters, one to the Honorable Secretary of Agriculture and the other to our Delegate, earnestly soliciting their aid in securing the desired assistance.

Copies of these letters follow:

(Copy of Notice Sent to Executive Committee, Feb. 10, 1906.)

Honolulu, February 10, 1906.

Dear Sir: A special meeting of the Executive Committee of the Farmers' Institute of Hawaii, to consider the recommendations of Delegate Kalanianaole regarding soil surveys

and a tobacco expert for Hawaii, will be held at 7:30 p. m. on Tuesday, February 13, at the library of the Territorial Board of Commissioners of Agriculture and Forestry on King street.

F. G. KRAUSS, Sect'y.

February 15, 1906.

Hon. J. K. Kalanianaole,
Delegate to Congress from Hawaii,
Washington, D. C.

Dear Sir: Acting upon your suggestions as set forth in your favor of January 4, 1906, to the Farmers' Institute, Honolulu, Hawaii, in which you desire to further the diversification of the industries of our Territory by recommending that Hawaii secure from the United States Department of Agriculture, through the Hon. Secretary of Agriculture, soil surveys of at least a part of each island in the group. Also, we note that in your consultation with Secretary Wilson, the Hon. Secretary offers to follow up the work by assigning a tobacco expert to establish the industry on a firm basis.

Recognizing the benefits that would result from such aid by the United States Department of Agriculture, a special meeting of the Executive Committee of the Farmers' Institute of Hawaii was called on the evening of February 13, at which time it was voted that the Hon. Secretary of Agriculture be petitioned to lend us every possible aid for the furtherance of a soil survey and the assignment of a tobacco expert.

We enclose herewith a copy of our letter to Secretary Wilson.

Very truly yours,

(Signed)

F. G. KRAUSS,
Secretary.

February 15, 1906.

Hon. James Wilson,
Secretary of Agriculture,
Washington, D. C.

Dear Sir: Our Delegate to Congress, the Hon. J. K. Kalanianaole, desiring to further all proper efforts for the improvement and diversification of the industries of our Territory, advises us, under date of January 4, 1906, of his consultation with you in regard to securing soil surveys of at least a part of each island in the group.

We are informed that you have promised favorable consideration to the matter, and, further, should you decide that this work can be extended to Hawaii, you will follow it up by sending a tobacco expert to establish that industry on a firm basis.

Appreciating the great benefits that would result to Hawaii by such aid from the United States Department of Agriculture, the Farmers' Institute of the Territory of Hawaii respectfully and earnestly petition the Hon. Secretary of Agriculture to use his best efforts to secure for our Territory as complete a soil survey as possible for each of the several islands forming the Territory of Hawaii, and also to assign a tobacco expert to these Islands to assist in establishing the tobacco industry, in which the Hawaii Experiment Station, with Territorial aid, has already made so favorable a beginning.

Trusting that this petition for the extension of Hawaii's agricultural resources will meet with your favorable consideration, we are,

Respectfully yours,

(Signed)

JARED G. SMITH,
President.

PERLEY L. HORNE,
ALEXANDER CRAW,
F. G. KRAUSS,
Executive Committee.

FINANCIAL STATEMENT.

Statement of Secretary-Treasurer for the Year Ending with the Annual Meeting, February 2, 1907.

	Disbursements.	Receipts.
Cash on hand beginning of year (handed over by the retiring Secretary-Treasurer, Feb- ruary 3, 1906).....	\$20.74	.....
Eight annual dues for 1906 at \$1.00.....	8.00	.....
Twenty annual dues for 1907 at \$1.50.....	30.00	.....
Stationery, printing, postage, etc. (including \$17.65 expenses in connection with Agricul- tural Exhibition)	\$42.00	.....
Cash prizes awarded at Agri. Exhibit.....	15.50	.....
Cash on hand.....	1.24	.....
	<hr/>	<hr/>
	\$58.74	\$58.74

Unpaid Bills—

20 subscriptions to Hawaiian Agriculturist and Forester at 50c.....	\$10.00	.....
300 letter heads	3.50	.....
Cash on hand .....	.....	\$ 1.24
Deficit .....	.....	<u>12.26</u>
	<u>\$13.50</u>	<u>\$13.50</u>

From the above statement it will be seen that the treasury is left with a deficit of \$12.26. The expenditures for the past year have been larger than in former years because of the agricultural exhibition held in coöperation with the Hawaiian Poultry Show.

The expenses connected with this exhibition were:

Cash prizes	\$15.50
Prize ribbons (ribbons \$2.70, printing \$1.50).....	4.20
Exhibit cards	4.50
Labor	2.00
Blue pencils .....	.20
Bunting	5.45
Plates	1.35
Total	\$33.15

The last two items, amounting to \$6.75, it is anticipated the Poultry Association will assume.

Early in November, 1906, the following circular was sent out to one hundred persons supposed to be interested in the Farmers' Institute movement, out of which twenty have responded by paying their dues for 1907. Probably more would respond if seen in person, but the limited time at the disposal of your Secretary-Treasurer has made this practically impossible.

Respectfully,

F. G. KRAUSS,
Secretary-Treasurer.

Dear Sir: It has been decided to raise the annual dues of the Farmers' Institute of the Territory of Hawaii to \$1.50. And upon payment of same, members will receive free the Hawaiian Forester and Agriculturist, which is the official organ of the Institute in Hawaii.

The Farmers' Institute dues were formerly \$1.00 per annum. The regular subscription price to the Hawaiian Forester and Agriculturist is \$1.00.

A copy of the Forester and Agriculturist containing the proceedings of the last quarterly Farmers' Institute meeting is being sent you under separate cover.

The annual dues are now payable, and an early remittance will be appreciated.

Hoping for a continuance of your membership,

Respectfully,

(Signed)

F. G. KRAUSS,
Secretary-Treasurer.

"JULIE" MANGO.

The Bulletin of the Trinidad Botanical Department, for January, contains the following note on this popular variety of mango:

The mango known as the "Julie" is one of the best, or perhaps the very best, of all the introduced kinds, and is daily gaining in favor, the demand for plants at the Government Experiment Station being larger than for any other kind. Among the reasons for this preference are: (1) Its excellent flavor; (2) Keeping qualities; (3) Suitability for transport; (4) Early bearing; and (5) Its ability to produce regular annual crops.

Its flavor recommends it to the majority of consumers, and as it has little or no fiber, it is eminently suitable for table use. Probably no mango known keeps good a greater length of time, and its tough skin renders it easy to pack for transit to long distances.

It fruits at a very early age, often commencing at four years from planting, and sometimes earlier. The tree has a dwarf, bushy habit, but in time grows to a large size. The "Julie" is one of the most regular croppers of all the mangoes.

It has been exported to England from Trinidad, and has arrived in first-class condition.

Compared with it, the famous Jamaica No. 11 is "out in the cold," as it can be eaten with a spoon, while the No. 11 is characterized by the large amount of fiber which adheres to the seed. It is a long way superior to the "Peters" or "Malda," and is always found in superior condition to that mango, which has the fatal fault of being frequently sour at the center.

Altogether, "Julie" takes the first place among the cultivated mangos of Trinidad, and the trees suffer less from disease than most other kinds. It is certainly a fruit which can be highly recommended for cultivation for export.

SOME HAWAIIAN CROP BLIGHTS.

Paper read by Dr. N. A. Cobb, H. S. F. A., at the last Annual Meeting of the Farmers' Institute of Hawaii:

"There is a widespread but erroneous notion that most organic things are more or less inherently frail, and that they decay or rot for reasons to be sought in this frailty.

Fruits rot: timber decays. It is often assumed that these occurrences are due to inherent tendencies of the things that rot or decay.

It is true that all living things have a definite period beyond which they cannot continue in the form of one individual. Our own limit has been set at three score and ten years to four score years, or thereabouts. Reaching this limit the human organism runs down. Appetite fails, and food ceases to nourish as it formerly did. The muscles become enfeebled and the nerves no longer respond to the old stimuli. Recollection fades, and as it has been beautifully phrased we "fall on sleep."

But this consummation is remarkable on account of its rarity rather than its commonness. As a rule before a man can live out his allotted span he is carried off by some accident or disease. He dies not because of some inherent quality but because of some outside cause. He loses his life by accident, or is carried off by some parasitic organism such as that of consumption, cancer, plague or smallpox.

Wishing to combat an erroneous notion by drawing a parallel I take our own life history as one part of the illustration because it is one with which all are more or less familiar. I think you will have little difficulty in assenting to the statements I have made.

Now what is true of mankind in this respect is equally true of all things organic. The losses due to rot and decay are as a rule not due to something that was inherent in the organic matter that rotted or decayed. In other words it was due to the attack of some organism or to some accident, and was not something that was at that time inevitable. These organic things rot, decay or otherwise perish, as a rule, long before their allotted span, just as we do. And it is just as true of these things that their life can be prolonged as it is that we could prolong human life much beyond the present statistical limit if we would only live up to what the more advanced among us vividly realize to be demonstrated fact. No one doubts that if all the individuals of this or any other community would live up to the standard of cleanliness and moderation easily shown to be best for us, the mortality statistics would be much altered. The amount of suffering would be much less, and the sum of human happiness would be so much the greater.

In the much humbler sphere to which I invite your attention for a few minutes the same holds true. The various parts of cultivated plants such as flowers, fruits, stems, foliage, and roots which we value for various reasons are by no means so inherently frail as they are often assumed to be. There is really nothing in a piece of sound fruit that can cause it to decay. When it decays it is usually because of some accident or some destructive organism. Because we do not fully understand what is taking place we say, "Oh, it just rots." And as the occurrence is a very common one we have grown to look upon it as unavoidable. Nevertheless within limitations the very opposite is true. So far as anything in itself is concerned almost any piece of sound fruit, even the most perishable kind, might remain sound for a long period. Give it the necessary conditions and you may see this at any time. Tin a pineapple or place it in cold storage and it will last for a long time, and if the operations be carried out in the right way, for a very long time indeed. The essence of this preservation is preventing the access of outside destructive organisms, or so lowering their vitality that they are comparatively harmless.

So with timber. There is no cause within itself why a post set in the ground should not last for centuries. The other day a friend showed me a piece of timber that had served in the foundation of an English house for over 700 years. It appeared perfectly sound. The beams in certain substantially built European chateaux have lasted for centuries and are today as sound as ever, in fact appear to possess valuable properties that less aged timber does not possess, as is evidenced by the fact that makers of musical instruments pay high prices to be allowed to dismantle these buildings and remove the old timber for use in the construction of wooden parts of musical instruments.

In the course of the few moments devoted this evening to the blights of our crops it will therefore be profitable to note the extent to which the previous remarks hold true, for if it prove true that in most instances our crop products are carried off before their time, it behooves us to inquire into the causes, with the object of ascertaining whether some of the losses are not preventable. You will observe that in many instances commercially valuable remedies are at once suggested as a result of an investigation into the causes of what were once looked upon as "just common rot such as we have always had."

"Just rot" may be as old as time, but no matter how aged it be it must not simply on that account escape re-examination in the light of the new truths made known in recent times through the investigations of scientific men. We must beware of thinking that because a thing always has been it therefore always will be.

I am wholly unprepared at the present time to give anything like complete observations on Hawaiian crop blights. I can give only a few notes on some of them. One of my objects will be to

call attention to the way in which anyone so disposed may assist in the work of collecting information on this subject."

Dr. Cobb then gave a series of lantern illustrations of some of the most noteworthy of the insect and fungoid enemies of Hawaiian crops and of timber. The subject of these will form a special illustrated article to appear in the next number of the Forester. At the conclusion of his address Dr. Cobb gave instructions for the forwarding of insect and other specimens by mail, and invited all who could to supply him with any such pests they should be interested in. The particulars given are included in the special article on the next page.

BY AUTHORITY.

SPECIAL WARNING NOTICE.

FIRE TO CLEAR LAND—WAIALUA DISTRICT, OAHU.

Notice is hereby given that in accordance with Section 6 of Act 71 of the Session Laws of 1905, it is forbidden to start fires for the burning of brush, dry grass, etc., for a period of six (6) months from date, unless the written permission of the District Fire Warden has first been obtained, within that portion of the District of Waialua, Island of Oahu, lying within the following boundaries:

On the South by the Waialua-Waianae District line; on the Southwest by the South branch of the Kaukonahua Stream; on the West by the Waialua Agricultural Company's new ditch from the Wahiawa dam and an extension of the line of the same, following approximately 700 foot contour, to the Waimea boundary; on the North and East by the Waialua-Koolauloa District line.

The law reads, "such fires shall not be started during a heavy wind or without sufficient help present to control the same, and the fire shall be watched by the person setting the same, or by competent agents of his, until put out." The District Fire Warden is Mr. A. M. Nowell of

Wahiawa.

RALPH S. HOSMER.

Superintendent of Forestry and Chief Fire Warden.

Honolulu, T. H., March 19, 1907.

PINEAPPLE CROP BLIGHTS.

The April issue of this publication will be of exceptional interest to pineapple growers. Dr. N. A. Cobb has in preparation a special illustrated article upon some of the blights of the pineapple industry, which will contain information of the greatest importance to growers of the fruit.

HOW TO SEND CROP DISEASES BY MAIL.

The forwarding of specimens by post is usually an easy matter. It is only necessary to enclose the specimens in a tin or wooden case such that the specimens may be fully protected from the handling to which the ordinary postal matter is subjected.

The most important point is that the specimens arrive in the freshest possible condition. To this end they should be gathered and packed shortly before the mail leaves for Honolulu. A few hours extra time in transit sometimes makes a great difference in the state of the shipment on arrival. This matter is therefore an important one, and, fortunately, in most cases, a little thought will make it no more difficult to comply with this condition than to neglect it.

If it can be done it is best to send the material in its natural state, that is, not preserved in any fluid. In the case of the softest and most perishable matter that can not be sent except in fluid, the best way is to place the specimens in a preservative mixture made by adding two parts of strong formaldehyde to one hundred parts of water, or one part of strong wood alcohol to two parts of water. After placing the specimens in a bottle, the bottle should be filled full of the preserving fluid so that there shall be no bubbles after the cork is inserted. It is best, unless the corking is uncommonly well done, to seal the cork over with wax or paraffin.

In sending matter of this class be careful to send all the stages that can be mustered, from the very earliest stages to the very latest. It is not necessary to send a large amount of material, but every stage possible should be included.

Blighted leaves and twigs may be placed loosely in a tin. The tin should be a close one unless the material will be several days in transit, in which case it may be advisable to puncture the tin with a few small holes.

As a rule, roots should be sent with the soil attached.

It is not best, as a rule, to send specimens in an ordinary envelope, but it is better to send them thus than not at all. Some specimens, such as dried leaves and bark, may be sent in this way if wrapped in several folds of soft cloth.

In case any special method is necessary, the empty package and the necessary preservatives will be forwarded free by post, after the receipt of specimens in the ordinary way proves ineffective.

Bottles containing fluid should be enclosed in boxes in packing material so as to preclude all possibility of breakage.

Specimens of leaves or twigs sent in their natural condition should not be gathered when wet, or, if gathered wet, should be allowed to dry until they resume their dry-weather appear-

ance. If enclosed in a package wet they are likely to become mouldy before arrival, and this is very undesirable. Roots should be moistened a little—just enough to preserve them in their normal condition until they arrive in Honolulu.

It is very desirable that notes should accompany the specimens. Give the condition of the plant or crop, the variety, its age, length of infestation, soil, nature of the present season, kind of culture, estimated monetary loss, etc.

Specimens should be addressed:

DR. N. A. COBB,

H. S. P. A. Experiment Station,
Honolulu.

DUCK EGG INCUBATION.

The method of incubating duck eggs as practiced by the Chinese of Hawaii is somewhat peculiar. A special room is devoted to this use, within which a bin is built, about three feet high, running round the room. Within this receptacle are placed ordinary wooden barrels lined with felt paper. The eggs to be hatched are spread on trays in the sun until they attain a temperature of from 102 to 103 degrees. They are then placed in the barrels layer upon layer, a thin cloth being inserted between each, and a heavier cloth covering the whole. The eggs are turned regularly by removing the layers of cloth one by one, with eggs upon them, and by replacing first the one taken from the top of the barrel. At the proper time the eggs are removed from the barrels and placed upon trays on racks above the bin. As soon as they are hatched the young birds are sold to the large ranches, at the rate of about \$50 per thousand.

THE "PAPAW" OF THE UNITED STATES.

The two cultivated and six wild species of Eastern North American shrubs and small trees, to which the name "papaw" is commonly applied by the Americans, are species of *Asimina* (natural order *Anonaceae*) closely related to the sweet sop or sugar apple of the tropics. The two cultivated species bear attractive flowers and edible fruits. One will grow in the open in New York State. The true papaw of the tropics, *Carica Papaya*, is not in any way related to the above-mentioned species. It is called in the United States "melon papaw" for the sake of distinction. It grows in the open only in South Florida; but is frequentiv in conservatories north of the frost line.—The Agricultural News, Barbados.

THE FUTURE OF HAWAIIAN RICE.

The presence of a large population of Japanese in Hawaii has given rise to a demand for Japanese rice. Although the Hawaiian rice is of excellent quality, and finds ready acceptance among the white residents and the Chinese, the peculiar characteristics of the rice to which the Japanese have been accustomed, has brought about an enormous importation of rice to Hawaii. With the idea of producing this at home and at the same time of stimulating the local rice industry, which for many years for different causes has been in an unfavorable condition, the United States Experiment Station has lately commenced a series of experiments to develop a rice best suited to our local condition of cultivation and to the peculiar requisities of the market.

The depression of the rice industry in consequences of the demand for the Japanese product commenced some years ago, and in consequence of the Japanese rice requiring no milling, many of the most important Hawaiian rice mills ceased operation. During the recent Russian war the Oriental supply of rice greatly diminished and Louisiana became the chief source of rice, which was grown from Japanese seed. It is with the idea of giving the home producer the benefit of the large local demand that the experiments alluded to are being conducted.

Hitherto the cultivation of rice in this country has been in the hands of growers who have been contented with primitive methods. A general depletion of rice lands has consequently taken place and at the same time the seed used has become greatly impoverished. A close observation of a rice field will reveal many empty stalks and many areas within which seed has not germinated. The length of growth, too, will be seen to vary considerably and much stunted rice will be noticeable. Besides these disadvantages the fields will be found to be invaded by an innumerable host of grasshoppers, chiefly confined to the edges of the fields, which levy as large a toll upon the ears as the persistent rice-bird. Together with the solution of the above difficulties the experiments will aim at evolving a rice possessing superior cultural, yielding, milling and culinary properties.

About one hundred and thirty varieties are being examined in the trial beds, received from trained agricultural explorers of the Department of Agriculture, who have for this purpose together investigated the rices of all the producing countries of the world. The various rices now being experimented with afford every diversity of growth and period of maturity. One promising sample from China, possessing the typical short kernel of the Japanese rices, ripens in seventy days. Other varieties show no sign of flowering, one hundred days after planting. The rice beds show every stage of condition and maturity. Some

samples are ten feet high and others fully low. Some are leafy and others possess almost bare stalks. Some varieties are sturdy and others show a tendency to droop. Every shade of color from a pearly white to a dull black hull is to be seen interspersed into numerous yellow and brown.

The plant breeder proceeds in this work with as much method and precaution as the breeder of stock. He has, however, this advantage in his favor: the greater number of individual members to experiment with and the greatly reduced period of generation. Having decided upon the superior merits of a particular variety, he with infinite care, generally based upon elimination of individuals, selects three of his best plats. The potential yield of each of them is then exactly determined per acre, and the heaviest producer is then reserved as the mother plant from which all future rice of that variety will be grown. In this manner a pure stock of known parentage is determined.

Each variety in the trial fields is thus treated in successive seasons until the most suitable is determined. This is a long and tedious process. Many beneficial results are also evolved by artificially crossing two or more distinct breeds. This phase of the work is one of unlimited potentialities and enables the breeder to attain an ideal standard. If by these methods a rice can be developed yielding one bushel per acre more than is now obtained, the cost of the experiments would be many times repaid in the first year. But the station confidently hopes to achieve much more than this.

The methods of improving plants by artificial means may be summarized as follows:

First: Inducing variation by altering condition of soil and environment, and by conveying the pollen of one variety to the ovary of another.

Next: The selection of desirable varieties, taking not the seed only, but the whole plant as a unit.

Lastly: The establishment of the power of the parent plant to transmit its acquired characters to its progeny.

The artificial crossing of rice, as, of course, with all plants, is brought about by means of the flower, in which the organs of reproduction are situated. The rice flower is a perfect one in which both sexes are represented. The six stamens contain the pollen which fertilize the ovary. In the case of the rice flower both cross and self fertilization takes place. When artificial cross fertilization is brought about the plant breeder first removes the pollen bearing organs to prevent self fertilization, and also protects the stigma, by means of a thin gauze from chance cross fertilization. At the proper time the desired pollen is introduced. The resulting cross is a blend of the characteristics of the two parents. Such operations are conducted with as much care as in the breeding of stock, and the results of successful

crosses may have a much wider economic effect than the establishment of a new breed of cattle.

The rice fields upon which the above experiments are being conducted are situated on King street, near Kalakaua avenue, and the work is in charge of Mr. Frederick G. Krauss.

RECENT PUBLICATIONS OF INTEREST TO AGRICULTURISTS.

*Message to the Legislature of Hawaii, by George R. Carter,
Governor. Honolulu, February 20th, 1907.*

Among much that is of general importance, the annual report of the Governor contains several paragraphs which relate directly to agriculture. With respect to the foundation of a Territorial Agricultural College, Governor Carter writes:

"Your attention is called to a special report of the Board of Education, conforming to a resolution of the last session of the Legislature, on the question of a Territorial Agricultural College. This report covers the laws under which such institutions have been established, and recommends ways and means for an agricultural college in Hawaii. The benefits conferred by such an institution will be apparent to you, and I concur in approving the report."

The preservation to the public of recreation grounds and parks has been a matter which has received particular attention of late, and we are glad to see the Governor's continued interest in this important policy. The attention of Legislature is directed to this work in the following terms:

"The rapid development of parks; of open spaces with green lawns; of recreation spots, illustrates a high degree of culture in our community and a deep interest in the welfare of those who can not afford the luxury of a garden. The recognition is general of the civic advantages of such beauty spots. The progress has been rapid, and it is suggested that legislation providing for a general park system would be opportune. It would facilitate the employment of experts and widen their field of usefulness. It would aid in the importation and distribution of flowers and decorative shrubs. At present the only nursery maintained in the community is that of the Bureau of Forestry, which, of course, deals only with trees. Such legislation should aim to stimulate the movement in all parts of the Territory."

The construction of county and homestead roads is one of great importance to the welfare of a class of the community from whose courage and industry the stable prosperity of the

country will in future years derive great benefits. The extension of the road system is adverted to by the Governor, and we trust that the Legislature will deem the time opportune to assist, by this means, the numerous citizens who have recently taken up homesteads. The severity of the recent storms, which have fortuitously terminated the protracted drought, has tested the rural road system, and in some cases demonstrated the necessity of building permanent and substantial highways.

During the two years ending December, 1906, nearly three hundred homesteads have been established throughout the Territory, of a total area of over nine thousand acres. The development of a beneficial homestead policy on the part of the Territorial officials is a particularly gratifying feature in the recent history of agriculture, and we congratulate the Commissioner of Public Lands on the excellent results which have been achieved.

Incorporated with the Governor's message are the estimates of appropriations for the coming biennial period for the Federal Agricultural Experiment Station. The projected investigations for which assistance is required include work affecting the rice, tobacco, silk, pineapple, citrus fruit and honey industries, and the establishment of effectual marketing of tropical fruits.

*A Preliminary Report on Rice Investigations by F. G. Krauss,
Expert in Charge of Rice Investigation, Hawaii Agricultural
Experiment Station, Honolulu. Press Bulletin No. 19.*

Rice is, next to sugar, one of the important Hawaiian crops. The industry has recently been declining through increasing competition with Japanese and Louisiana rices, and to some extent through deterioration of the local product. A series of experiments has therefore been begun by the Hawaii Experiment Station to determine what improvements in methods of cultivation, harvesting, fertilization, milling, breeding and selection can be introduced to bring about the rehabilitation of the industry. These experiments are made possible by the generous contribution of the Bernice Pauahi Bishop Estate and also through the use of lands placed at the Station's disposal by the Ii Estate, Ltd.

Three projects or lines of work have thus far been planned for these investigations, as follows: Rice culture; rice breeding; and fertilization and rotation.

The investigations relating to culture include tillage, seedage and harvesting. The slow, laborious methods of tillage prevalent in Hawaii are familiar to all, and the introduction of specially-designed machinery is being carefully considered. The primitive process of transplantation will also probably be

improved and may be supplanted either by drilling or by broadcast sowing. As great a development is anticipated in the harvesting methods, and the Forester for November, 1906, contains a description of the first use of a modern harvester in a Hawaiian rice field.

Rice breeding is a phase of the work calling for expert and painstaking investigation. So much has been done in breeding new wheats and corn that there is every assurance that the present experimenters will develop a rice specially fitted to our needs and of a full harvest yield. By continuous selection and elimination a pedigreed seed stock is being evolved which may in time almost double the yield obtainable from unselected seed.

The use of suitable fertilizers, the determination of a proper crop rotation and the investigation of rice diseases offer a wide field for experiment, and each of these features is being actively studied by the Expert in Charge.

FARMERS' BULLETIN NO. 274.

Forage-crop Practices in Western Oregon and Western Washington. By Byron Hunter, Assistant Agriculturist, Farm Management Investigations, Bureau of Plant Industry. Pp. 40, figs. 4.

This bulletin is a reprint of Bulletin No. 94 of the Bureau of Plant Industry, and contains information and suggestions concerning hay making and the growing of forage crops west of the Cascade Mountains in the States of Oregon and Washington. It also describes the climate and the conditions of the farming lands of that region.

FARMERS' BULLETIN NO. 275.

The Gipsy Moth and How to Control It. By L. O. Howard, Entomologist. Pp. 24, figs. 7.

Life history and description of the Gipsy Moth (*Portentaria dispar* L.), the territory infested in the United States, its natural enemies, remedies, etc., with statements as to the measures taken by the State of Massachusetts and the Federal Government for its control.

N. B. The above two publications are obtainable free, from the Secretary of Agriculture, Washington, D. C.

The following publications have also been recently issued and will be referred to more fully next month.

Proceedings of the Hawaiian Entomological Society, Vol. 1, part 2.

acres of land in the Hawaiian Islands available for the production of this crop; with a duty of 2 cents per pound, or with a direct bounty of \$30 per ton, Hawaii could produce 30 per cent. of the whole quantity now consumed within the United States, and this maximum could be attained within ten years.

"There is no other industry comparable with the coffee industry for the support and maintenance of a European citizen population. The coffee belt is the most salubrious in the island, and the whole industry is one to which white men would readily turn their attention, provided the National Government would give to this industry the same protection that is afforded to sugar and other crops. Assuming that the average yield of sugar per acre is 4 tons, and that every acre of cane requires two years for its growth, it will be seen that there is a protective tariff of \$68 on every acre of cane grown in Hawaii. The American sugar tariff of \$34 per ton is not entirely prohibitive as regards the importation of sugar from foreign countries. Coffee is a white man's industry, and as such it should receive protection equal to that given to sugar cane. A duty of 2 cents per pound would yield about \$20 per acre protection. A duty of 5 cents would undoubtedly prove prohibitive to foreign competition, and would lead to the investment of \$100,000,000 of outside capital in Hawaii during the next five years."—Jared Smith, in his article "Agricultural Experiment Work," in Governor Carter's annual report.

ISLAND POULTRY YARDS.

Mr. F. H. Krauss has recently established a Poultry Farm at Kalihi, under the above designation. He will import and breed mainly S. C. White Leghorns and Barred Plymouth Rocks, and is ready to furnish eggs for hatching or the table, and breeding stock.

A NEW COMMISSIONER.

As this number of the Forester goes to press, the news has been received of the appointment by Governor Carter of the Hon. Paul R. Isenberg as a member of the Board of Commissioners of Agriculture and Forestry, to fill out the unexpired term left vacant by the resignation of Mr. L. A. Thurston. Further notice of this change in the personnel of the Board will appear in a later issue.

TITLE PAGE AND INDEX.

The Title page, Index, and Table of Contents of Volume III accompanies this number.

VOL. IV

APRIL, 1907

No. 4

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform Hawaiian readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER & AGRICULTURIST

VOL IV.

APRIL, 1907

No. 4

The resignation of Mr. Thurston from his position of Commissioner of Agriculture and Forestry is to be regretted by all who have been associated with him in the work of the Board of which he was President. The present efficient status of the forestry system in Hawaii, and of agriculture in general, owes much to his ability and efforts on its behalf, and to him is to be attributed the inception of many of the beneficial enactments which have been made of late years for the benefit of the agricultural industries of the Territory. Among the many duties of a busy life, we hope that Mr. Thurston will still find a place to assist in furthering many of the projects associated with the work which he is now relinquishing.

The election of Mr. W. M. Giffard to the Presidency of the Board of Commissioners of Agriculture and Forestry at a recent executive meeting of the Board, will be received with approbation by all readers of the Forester. It will be remembered that among the many services which Mr. Giffard has rendered to the cause of the diversified industries of Hawaii, is to be included the projecting and institution of this publication itself, of which he became first editor. Under the new President of the Commissioners of Agriculture and Forestry we have the assurance of a continuance of the efficient and vigorous course of action which has marked the Board's policy in the past.

By far the most important event to the agriculture of this Territory which has been recorded for some time, is the provision by the Legislature of a sufficient fund to establish and maintain a well equipped Agricultural College. The exigencies of modern life have made it incumbent that the agriculturist of today, in order to be efficient and to render his land fully remunerative, be a man of wide knowledge and experience, whose methods are founded upon the substantial basis of practical science. The days have long since passed which only demanded of the tiller of the soil that he should follow the slow and laborious footsteps of his progenitor and be content with a scanty harvest wrung from the unwilling earth. With such unprogressive and conservative methods the agriculture of the day has no concern, and the country, whose people are contented with them must as long as they obtain, remain backward and undeveloped.

The necessity of imparting the technical knowledge necessary

to modern husbandry by means of scientific educational institutions has only been properly appreciated in comparatively recent times. It has been brought about by a number of different agencies, some of them operating from without and others having their inception in the industry itself. The cumulative effect of the conditions referred to, taken as a whole, has been to render ever more and more exacting the amount of special knowledge and training necessary in the successful agriculturist. The quantity of expert information now demanded is so great that no individual can acquire it from mere personal observation or from serving an apprenticeship in the routine of an ordinary farm. It is therefore necessary that educational institutions be established where the sound practices of modern agriculture may be acquired. To effect this, recourse must be had to well nigh every department of human knowledge. The geologist, the botanist, and the chemist must be consulted, and physics, physiology and the mechanical arts must alike yield their assistance. The laws determining heredity must be investigated and those influencing the perpetuity of beneficial individual traits investigated. The science of bacteriology will be required to teach an understanding of various operations of the dairy which formerly were relegated to chance. The practices of the modern forester must be evoked to render productive sterile wastes and to reclaim areas denuded by the improvidence of a thoughtless generation.

Of those agencies operating from within which have necessitated the application of scientific and other modern knowledge to agriculture, may be briefly mentioned the inherent tendency of all cultivated crops to develop disease or invite the attacks of insect pests, when grown upon an unprecedented scale on the same ground for many successive generations. It is not necessary in this country to dwell too long upon the object lesson which has been before it of this phase of the question with regard to our staple industry. In the early history of Hawaii when sugar cane was only grown in such small quantities as to satisfy the local requirements of the natives, it is improbable that the plant was attacked to any appreciable extent by either fungoid or insect pests. As the industry has developed, however, and the area of production increased to extraordinary proportions, together with the growth of successive crops upon the same land, the development of special breeds of cane has rendered the crop itself susceptible to the ravages of special disease, and has also facilitated the introduction of enemies from other countries. So great has been the effect of these onslaughts that were it not for the prompt and energetic application of entomological and other scientific methods it is questionable whether a ton of sugar could now be exported from the Islands. With regard to the sugar planter, the enormous ex-

tent of the industry, enables him in Hawaii to equip and maintain a scientific establishment, with a corps of expert officials, to combat the evil. With the agriculturist, however, there is often no such recourse and he must often rely upon his own knowledge and experience to act promptly in matters affecting the very existence of the venture upon which he has invested his capital. Nor is it the large industries which have to assert their well-being by a constant scientific warfare. In some countries, as is known to every reader of agricultural history, whole industries have been destroyed for lack of promptly instituting scientific remedies when the enemy was yet in its incipient stage. In many instances communities which have become enriched by a successful industry, have become utterly impoverished in a few seasons by the failure of their staple crop under the attack of disease. Coffee, vanilla, the grape vine, and many other industries have both made and ruined the fortunes of countries, and the latter phase has unquestionably been due to the lack of proper scientific knowledge, and a lively sense of the impending danger. Referring again to more local conditions, it does not take great observation to discern that even with all our boasted scientific knowledge, the mango crop of the islands is in danger of suffering materially unless the continual application of modern knowledge be exerted on its behalf. Our taro crop, essentially a primitive industry and one at first thought which should be immune from such dangers as have been referred to, is threatened with more than one disease. The condition of our rice industry was lately so precarious that the coöperation of both local and federal assistance was enlisted to discover suitable remedies to reinstate it among our remunerative agricultural pursuits. It is only by recourse to the accumulated knowledge of the sciences as understood and intelligently applied by modern experiment and practice that a substantial and permanent improvement can be achieved in this industry. But by these helps, an almost double yield of improved grain can be predicted, at a smaller cost than that necessary to produce our present crop.

The welfare of a rapidly increasing part of our inhabitants is more or less closely associated with the pineapple industry, yet here is a condition of affairs which has obtained before in many countries and which contains within itself the factors for its own destruction from disease. The prompt application of approved methods is necessary to ward off the threatened enemy, and here again we look to science for a solution. Before these onslaughts, the individual, however hardworking, however energetic and intelligent, is absolutely helpless, without a scientific training acquired in a modern agricultural college.

Among the external influences which have been at work to accumulate the sum of knowledge necessary to success-

ful husbandry may be mentioned the development of market demands, the intensified competition among producers, the general raising of the standard of living in progressive countries, and the dissemination of education. This latter factor has acted as an especial stimulus in this direction as it has been seen that of two men endowed in other respects alike, success has followed the one who possessed the greater store of suitable learning to draw upon. With the factors alluded to at work has come the necessity of larger crop production and of more economical methods of tillage and harvesting. To assisting the enhancement of harvest yield, have come, among others, the chemist and the soil expert, who have determined the proper constituents of plant food, and the scientific plant breeder, with special knowledge of the laws determining the establishment of varieties and the evolution of new breeds. The question of economic harvesting has been very generally solved by the mechanical devices of the engineer.

It is not alone in the plant crops of the farm that this special knowledge to which we have been alluding applies, but the same is necessary to the breeder of all farm stock. With these latter, whether the object aimed at be the profitable production of horses, or sheep, or even the more lowly feathered stock, the most successful operator will be the one who has the greatest store of suitable knowledge to draw upon. The chicken breeder will have more opportunity to succeed who has the principles of Mendell's laws of heredity to assist him, than he who is groping in the dark, as must he whose lore has been learned by merely observing local conditions.

It is to be noted that the legislative appropriation to which we have alluded does not confine its operation to agricultural education alone, but embraces in its scope the wide field covered by the mechanic arts. The liberal policy of making provision for instruction in other departments of technical education is to be commended, and its influence will doubtless exercise as beneficial effect in other branches of industry as that which we anticipate in agriculture.

With the establishment of an institution in this Territory imparting a knowledge of the sciences tending to a better knowledge of the requirements of every department of husbandry, and affording a technical education in other fields calculated to fit the student for the diversified industries and means of livelihood of the islands, a new impetus will be given to the development of Hawaii. We predict a great work and future for the Agricultural College soon to be founded in our midst and wish it all success.

BOARD OF AGRICULTURE AND FORESTRY.

Division of Entomology.

PRINCIPAL CITRUS INSECTS IN HAWAII.

By JACOB KOTINSKY.

(Continued from last "Forester.")

TABLE FOR IDENTIFICATION OF COMMON CITRUS INSECTS IN HAWAII.

This table was drawn up to aid the grower of citrus trees in identifying the insects upon them that are of economic importance. It is especially hoped that school teachers will make liberal use of it in determining citrus insects that may come their way. The table does *not* include *all* the insects that may be on citrus plants. Even as it is, some of the insects, like the snow and acuminate scales and the white-fly are, so far as known, only of local occurrence and would not have been included but for their economic importance elsewhere and the possibility of their assuming similar importance here in course of time. More detail instructions for the use of the table will follow it. It is not intended that the table should answer the purpose of absolute, unquestioned identity of the insects enumerated therein, and the student is referred to subsequent pages in the text for more detail descriptions.

Name preceded by asterisk (*) is of a beneficial insect.

Name preceded by ?* is of an insect of questionable use in orchards.

I. ON VERY YOUNG, SOFT GROWTH.

Dark, small, soft, smooth-bodied, winged and wingless, usually in large numbers.....	<i>Aphis or Plant-lice</i>
Among the aphis usually.	
Stationary, minute, pearly white.....	* <i>Egg of Hover-Fly</i>
Green maggot, pointed at mouth end, where it often holds an aphis.....	* <i>Larva of Hover-Fly</i>
Miniature alligator-like insect, dark body with whitish markings.....	* <i>Larva of 8-spotted Ladybird</i>
Brown, spiny grub, over twice as long as broad.....	* <i>Larva of Yellow-Shouldered Ladybird</i>

2. ANYWHERE ON THE TREE, LEAVES, OR FRUIT.

With legs and wings freely used.

Wings four.

Wing covers horny, shell-like insect shaped more or less like the half of a sphere, flat side down.....	* <i>Ladybird</i>
Steel-blue in color.....	* <i>Steel-blue Ladybird</i>
Uniformly-orange	* <i>Orange Ladybird</i>
Red or orange, spotted with black.....	* <i>8-spotted Ladybird</i>
Orange, with round dark spots in lighter circles..	* <i>10-spotted Ladybird</i>

- Black, with 2 or 3 yellow spots in front.....
*Yellow-Shouldered *Ladybird*
- Red, with dark spots.....**Vedalia Ladybird*
 Longer than wide, dark, orange front and rear..
*“Brownie” *Ladybird*
- Only front half of upper wings horny or all wings
 shorter than body; legs, head and snout rather
 long; red and dark bronze on top; moves rather
 slowly?**Hawaiian Kissing-Bug*
- Wings transparent, gauze-like, folded roof-like over
 its body when at rest; uniformly green or brown,
 good-sized insect ($3\frac{1}{2}$ in. long).....**Lace-wing Fly*
- Wings transparent, either folded flat on back or in
 motion; insect very tiny, brown, black or brown
 with black markings.....**Scale Parasite*
- Wings white or yellowish, mealy, insect very small....*White Fly*
- Wings two.
 Very tiny insect, wings folded flat on back, cottony
 threads often project behind.....*Male of Scale Insect*
 Good-sized fly, light brown with darker markings and
 bronze thorax, hovering about an *aphis* colony or
 resting nearby**Hover-Fly*
- Wingless, but with legs.
 Moving rapidly when disturbed, with curved pincer-like
 organs in front and a pile of rubbish on its back.....
**Larva of Lace-wing Fly*
- Moving slowly, spiny, pale yellowish....**Larva of Steel-blue Ladybird*
- Moving slowly when disturbed, covered with very white,
 conspicuous, waxy filaments.....**Larva of “Brownie” Ladybird*
- Moving slowly, reddish, usually on cottony cushion scale..
**Larva of Vedalia*
- Oval, convex, reddish, with yellow or white fringe about
 margin.....*Young Cottony-cushion Scale*
- Very tiny, yellow or purple, more or less mealy..*Young Scale Bugs*
- Without wings or visible legs.
 A dark-brown batch, sticky to the touch, whitish on top,
 usually on leaf.....?**Ligg-batch of Hawaiian Kissing-Bug*
- Yellowish batch of eggs standing on end, 6-12 in batch,
 usually on leaf.....**Eggs of 8-spotted Ladybird*
- Tiny, green egg at end of slender rod, the other end of
 which is fastened to the leaf.....**Egg of Lace-wing Fly*
- Pearly sphere, size of small, mourning pin-head, fastened
 to leaf.....**Pupa of Lace-wing Fly*
- Brown, gray or black organism of indefinite shape, with or
 without spines, occurring singly or several together,
 fastened to the leaf.....**Pupa of Ladybird*
- With leathery or horny cover.....*Scale Bug*
- Scale horny, circular, convex, dark.....*Florida Red-Scale*
- Scale as above, but reddish, insect adheres to scale
 when latter is raised.....*Orange Red-Scale*
- Scale mussel-shell shaped, brown, distinctly keeled
 lengthwise, male scales numerous, white.....*Snow Scale*
- Scale as above, but *not* keeled, more or less comma-
 shaped, shape and color of male scale same as
 female, only smaller.....*Purple Scale*
- Scale somewhat elongate, but with parallel sides, cen-
 tral portion black.....*Mediterranean Scale*
- Scale elongate with parallel sides, less than $1/25$ in.
 long, pale yellow.....*Pupa of White-Fly*

Scale triangular, greenish when fresh.....	<i>Acuminate Scale</i>
Covering cottony, sack containing insect globular, yellowish.....	<i>Globular Mealy Bug</i>
Long, white, fluted cottony-sack at rear end of insect, which appears to stand on its head.....	
	<i>Full-Grown Cottony-Cushion Scale</i>

HOW TO USE THE TABLE.

Following the table it is not impossible to locate the names of most of the insects therein without the use of instruments. In the case of some of the insects, however, it is absolutely essential to resort to mechanical aids. These are of a very simple character and inexpensive. A pocket lense, the first requisite, may be secured in any optical or photo-supply establishment for from 50 cents upwards. The uses of a pocket lense are so numerous these days, especially to plant breeders and teachers, that none should be without it. The use of the lense and what observations one can make with the aid of it are an education of no inconsiderable merit. If the insect is active a small vial with a cotton or cork stopper, or a glass with a cloth or paper cover, will be found convenient. A penknife or pin is the other requisite, and the laboratory is complete. Armed with these two simple implements one can readily determine some of the finer points of structure that had to be drawn upon for differentiation between closely-allied species. An insect that is normally active, but stationary at the moment of observation, can be induced to move with the touch of pin or penknife point. One that is normally stationary, however, will fail to respond to the hard point, and thus be thrown into another portion of the table.

Indentures are used for the various groupings, so that when the appearance of an insect does not correspond to the description given in a certain line, we turn to the next line that is the same distance from the margin. For example. Suppose we have before us the larva of the yellow-shouldered ladybird, but do not know what it is. We turn to the table, where the first line reads: "I. On very young, soft growth." Yes, we say, there is where we found it. The next line reads: "Dark, small, smooth-bodied, winged and wingless, usually in large numbers." Now, our insect may, after a fashion, answer to the entire description, but we did not find it in "large numbers," hence we proceed to the next line. "Among the aphis usually." Yes, we found it "among the aphis." The next line begins, "Stationary," but we have ascertained after brief observation that our insect is *not* "stationary." It is not the next one because it is *not* "green." Nor is it the next one, because it is scarcely "alligator-like," and bears *no* "whitish markings." We find the next line to read, "Brown, spiny grub, over twice as long as broad," a description that corresponds fairly

with the insect in hand. But to be more certain of our identification, we will look beyond (in subsequent number of the "Forster"), under the heading "Yellow-shouldered Ladybird," and there find a more detail description of the insect. The asterisk before the name in the table points to the fact that the insect is useful; it feeds on place lice, and hence deserves our protection.

One not accustomed to the use of such tables will, of course, experience some difficulty in the beginning. A little practice will, however, soon make one proficient in its use, and the persevering will probably find it even fascinating to be able to exclaim, "Eureka!"

(*To be continued.*)

BOARD OF AGRICULTURE AND FORESTRY.

Division of Agriculture.

CASSAVA.

Much attention has recently been given to the development of cassava cultivation in subtropical and tropical regions. The food value of the plant has long been known. It has probably reached its highest development in the West Indies, Brazil and other South American countries, as well as Java and India, where long cultivation and selection have evolved a large number of cultural forms or varieties. Cassava is well known to the native Hawaiians as a food plant, and now bears the name of *Pia*, which was by the older generation applied only to the native arrowroot (*Maranta arundinacea*). Cassava is one of the chief food plants of the West Indies, taking the place there, and in other tropical lands, of the Irish potato in colder climates.

In the Southern States cassava has within the present decade received much attention as a forage crop for feeding and fattening hogs and cattle. It is used on a large scale on at least one of the larger ranches in Hawaii, and is rapidly acquiring high value in the estimation of those who have tried it.

A third use for this important food and forage plant, and one which promises to vastly increase the area of cultivation, is the utilization of its fleshy roots in the manufacture of starch, glucose and dextrine.

The commercial starches used for glucose and dextrine manufacture have been chiefly corn and potato. Corn and corn starch have been rising in price because of the increasing number of uses for this grain. The statement has been made that corn cannot profitably be used as a source of starch when it is worth more than 45 to 50 cents per bushel in Chicago. The tendency of the prices of both corn and potatoes is bound to be upwards, with the continued and rapid increase in population in the United States and the consequent diversion of corn and corn products to

use as food rather than industrial manufacture. Important as starch is as a food product, the greatest market for it has been and probably will continue to be the cotton cloth, paper and other similar manufacturing industries. If potato starch and corn starch are to find increasing consumption as human food, thus forcing up the price, the textile industries must seek other starches which can continue to be produced at a low cost.

Cassava starch, or, as it is commercially called, "Tapioca flour," has hitherto been produced only on a small scale and by comparatively crude methods. It has not competed with corn or potato starch because of high cost due to crude methods of manufacture. The quantity annually offered for sale has also been small and too variable to create a standard of comparison with the other starches offered in enormous amounts.

Considerable impetus has been given to the manufacture of starch from manioc within the last few years. The industry has become established on a sound business basis in Florida and in Jamaica.

There is one starch factory in operation on Kauai, but the plant is not modern, and the business is conducted rather as an adjunct to cattle feeding, the intention being to utilize some of the surplus not required for stock food to supply laundry starch for sale in the local market.

An average of something more than 100 analyses of the fresh cassava roots shows from 25% to 27% of starch and from 4% to 17% cane sugar, the latter, however, more often low than high. For every 100 pounds of root there are approximately 27 pounds of starch and four pounds of sugar. By the process of crude manufacture in vogue among the Chinese, who were the first to produce starch in Hawaii, the amount recovered is seldom more than one-half of the total starch in the root. A maximum approximating twenty pounds is obtained in the Florida factories. An improved method of manufacture is now being adopted in the West Indies by which almost all of the starch in the root may be recovered, the average amounting to 25 pounds out of a possible total of 26 to 27 pounds present.

The earliest method used for accomplishing fine division of the pulp and the rupturing of the root cells to permit the escape of their contained starch grains was to grind or crush the roots, run the crushed mass into tanks with water and allow it to ferment. During the fermentation process the lactic and acetic acids formed disintegrated the cellulose and broke up the cells, allowing the starch grains to escape. After several days' fermentation, the mass was repeatedly washed to recover the starch. This method was extremely wasteful as well as unhygienic, and has long been discontinued.

The method of starch extraction universally used up to 1903 has been, in brief, as follows: The roots are washed, peeled and grated. The pulp flows over long sieves placed on an inclined

plane and is acted upon by streams of water. These sieves are subjected to interrupted lateral motion, so that the wet pulp is shifted about and constantly subjected to the jets of water thrown upon it. On this account the batteries of sieves are known as "shakers." The starch milk which passes through the sieves flows into vats or tanks, where the starch is repeatedly washed to separate out the impurities. It is either allowed to settle in tanks or, in some factories, is concentrated by means of vacuum pans without heat. It then goes through further washings and is treated with dilute alkalies—processes the object of which is to purify and bleach the product and create uniformity of grade. The purified starch is finally kiln-dried with dry air and is ready to pack in barrels for export or home consumption. The pulp which flows from the lower end of the sieves is either treated as a waste product or is dried, pressed into bales and used for cattle feed.

In Florida this dried pulp is said to have a value of \$10 to \$12 per ton, but far more has been produced than could be utilized. This waste pulp contains at least 20% and often 25% to 30% of all the starch that was in the root.

In the "shaker method" of starch manufacture the extraction depends upon (a) the fineness to which the pulp is ground or grated and (b) the thoroughness with which the pulp can be washed. It has been unfortunate that the machinery used in cassava factories has been in most cases adapted from forms first invented for other lines of manufacture. Cassava starch grains are very minute, approximating those of corn rather than potato. The pulp graters used for cassava were modified either from potato graters or from sugar beet pulpers. Potato starch grains are very much larger than cassava, and it is needless to mention that the extraction of soluble sugar from beet pulp is quite unlike removing solid starch grains from their station in the plant cell. It is difficult to bring about a sufficiently fine subdivision of the root tissues so that each cell shall be ruptured permitting its starch grains to escape. A certain amount of starch is bound to remain. This starch residue in the pulp may represent the profit of manufacture, so that unless a market can be created for the waste there may be too narrow a margin of safety between profitable and unprofitable manufacture.

The manufacturers of corn starch, on the contrary, starting as they did with a hard and flinty seed as the source of their product, rather than a fleshy watery root, used the ordinary flour milling machinery as the basis of evolution for their special machinery. Manufacturers of corn starch use a burr-stone modified for treating wet grain. Obviously, the corn pulp is thus at the start in a much more finely-divided condition than the cassava or potato pulp produced by saw-tooth graters. The corn starch manufacturers save practically all of the starch in the corn kernel.

The new method of manufacturing starch from cassava roots

borrows from the corn starch side of the industry, the burr-stone of the flour miller, modified for the treatment of wet grain, to grind the root so that the ultimate cells of the root are ruptured and torn apart.

The second improvement is the adaptation of machinery used in the extraction of precious metals from free milling ores. The principle on which this works is that the rate of motion of bodies falling freely in a fluid varies in accordance with the ratio of their specific gravity to that of the fluid. The amount of friction developed varies with the size of the particles. If particles of equal specific gravity, starch grains for instance, fall through an upward-moving column of water, the fluid exercises a weighing capacity, so that the starch grains, which are of uniform specific gravity and equal size, are separated from the particles of cellulose and fiber constituting the bulk of the mass of the finely-ground cassava roots.

The finely-ground cassava pulp, falling through a vertical pipe into a conical separator constructed somewhat on the principle of an ore separator of the above type, is met by an ascending current of water which carries the starch grains upwards through a wire gauze diaphragm, while the cellulose and fiber remain within the cone. When the charge of pulp is exhausted it is discharged automatically through the bottom of the cone and is ready to be freed from its water, dried and baled for stock feed.

The impure starch milk flows from the upper part of the separator, and is conducted to iron settling tanks with conical bottoms. The milk flows down a tube to the bottom of the cone. It then ascends in the increasing sectional area of the cone, in which the liquid suffers reduction of velocity. The downward motion of the starch grains overcomes the upward motion of the fluid, which continually flows away as dirty water through a pipe in the upper part of the vessel, while the starch in a highly-concentrated state is continually drawn off through a valve in the bottom of the cone. The concentrated starch milk is then treated with alkali, washed in shakers and run through a final battery of purifying cones. The purified starch milk is run into vats and the starch kept in suspension by means of agitators. From the vats the milk runs into wooden boxes with perforated bottoms, lined with muslin. These boxes are placed in a vacuum chamber and the water extracted. The solid blocks of starch are then cut, wrapped in paper and placed in a drying kiln, from which the starch comes out as a marketable product.

To make tapioca, the starch blocks taken from the boxes are crushed and placed in a steam-jacketed cylinder and the steam turned on. The heated starch grains burst, causing the starch to assume the well-known form of tapioca.

Where cassava is to be used in the manufacture of glucose the

For fuller details, see Journ. Soc. Chem. Ind., 21, 4; and 22, 63.

whole of the ground pulp is pumped direct to the converters, and the process of manufacture is the same as for corn or beet pulp.¹

CULTIVATION.

Cassava grows in Hawaii as a perennial, although commercially it is best to treat the crop as an annual. It thrives at sea level on the kona side of most of the islands, and up to 3000 feet in all, except the very wet, districts on all of the islands. Cassava requires about the same soil as the sweet potato and maintains an existence for a surprisingly long time under the worst conditions of neglect, even when overgrown by lantana and other weeds. A few plants are usually to be seen in the kuleanas of the native Hawaiians, who give it even less care and attention than they bestow on their sweet potato crop.

If the cultivation of this crop is to be undertaken on a commercial scale, land should be selected which can be plowed. Shallow plowing (6 to 12 inches) is to be recommended rather than deep (12 to 30 inches), in order to keep the roots near the surface and facilitate harvesting. After the land is plowed and harrowed, furrows are thrown 4 to 5 feet apart. The seed, consisting of cuttings of the stalk of the plant 3 to 8 inches long, are dropped in the furrow, two to a hill, 2 to 4 feet apart in the row. The seed is then plowed under. The best results have been obtained here in Hawaii from plantings made from November to February. The field should be hoed twice, or, better, the soil stirred and weeds kept in check by running a one-mule cultivator between the rows. By the end of the wet season the plants will be high enough to keep ahead of the weeds and the crop may be laid by.

No irrigation is required. A moderate application of a low-grade complete fertilizer such as would be used for any other crop of low value (compared with cane) is recommended. Hawaiian soils are mostly lacking in potash, so that this element should be used rather freely.

HARVESTING THE CROP.

The roots from seed planted in January may be harvested the following October or November. The roots will remain for a long period in the soil and if allowed to grow for two years will greatly increase in size and weight, but somewhat at the expense of starch. Two-year-old roots are often hard and fibrous, containing little starch. Cassava roots rot very quickly after being dug, and can seldom ordinarily be kept for over a week. However, as long as they remain in the ground they do not rot unless the plants are diseased. Old roots and old stems are often infested to a greater or less extent by borers. Mice and the field cockroach destroy the roots. Because of the wastage through the

work of mice and insects it would not be advisable to treat cassava commercially as other than an annual in Hawaii.

MEANS OF REMOVING FROM THE GROUND.

As the roots are of considerable size, often from 3 to 4 feet in length by 2 or 3 inches in diameter, and as they grow in clusters of from four to eight on each stalk, a single cluster often weighing from 20 to 30 pounds, the digging cannot be done with a plow, as sweet potatoes are dug, but must be done by hand. The original section of seed cane which was planted does not decay when growth begins, but continues to live and grow through the entire season, the new stalk usually growing from one end and the cluster of roots from the other. The piece of seed cane which was planted thus becomes what is called the "union" between the stalk and roots of the new plant. When the stalks are cut, either for seed canes or to clear the land for digging, a stub 5 or 6 inches high is left to show the position of the roots and to furnish a hold for pulling them from the ground.

IMPLEMENT USED IN DIGGING.

Various tools are used in digging, and sometimes, especially when the soil is very light and the root growth is small, the work is done by simply grasping the stub with the hands and pulling the roots, without the use of any tools. This method answers very well on light soil and when only a few roots are gathered daily, but where the soil is of fair quality, and where any great amount is to be gathered, some simple tool is of great assistance. Some growers use a grubbing hoe, pushing the blade into the ground under the union and then alternately pulling and prying until the roots are so loosened that they can be lifted out. Others use a cant hook, such as is used in handling logs, pushing the hook under the union and then lifting the cluster of roots from the soil. Still others use pinchers much like large blacksmith pinchers, but with the end of each handle turned into a ring for a hand hold. The user grasps the stub with the jaws of the pinchers and then pulls and shakes the root cluster until it is loose from the soil.

Where considerable quantities of the root are to be dug, an implement called a "lifter" is very commonly used. This lifter is simply a straight piece of wood about 8 feet in length and 2 inches in diameter, with a V-shaped hook about 2 feet from one end. The hook is of iron or steel, and can be made by any blacksmith from an old file or a piece of a wagon spring by bending it edgewise, so as to make the opening from 5 to 6 inches in length and about 2 inches in width at the open end. Two holes are punched through one arm, so that it can be bolted to the

wooden handle, and the inside edges are beveled from below, so as to make them sharp. This hook is bolted to the handle in such a position that the inner edge of one arm is about an eighth of an inch outside the side of the handle, and usually on the right-hand side as a matter of convenience. The opening of the hook is toward the long end of the handle, and the lifter is used by catching the hook over the stub and then lifting and shaking the roots until they are free from the soil. The short end of the lifter, which rests on the ground, is sometimes finished off by bolting to it an old spade blade or some other piece of iron of a similar shape to give a broader rest, which will prevent the end of the lifter from burying itself too deeply in the soil and which is also very convenient for chopping off weeds or other obstructions and for a little digging, which is sometimes needed. The arms of the hook should be from $1\frac{1}{2}$ to 2 inches in width, and the handle should have a little additional size where the bolts pass through, as both hook and handle are under a considerable strain when lifting heavy roots from a compact soil. The cost for digging will depend on the yield, but will not be far from \$1 per ton.²

A yield of five tons of cassava roots per acre is perhaps above the average, taking into consideration the whole area cropped, but yields of from five to eight or ten tons may be counted on in good land with favorable seasons. When the yield is much under five tons there is little profit in growing the crop for starch or glucose, but the roots are good feed, especially for cattle. It would seem that the cultivation of cassava for starch or glucose manufacture might well be carried on in connection with the fattening of cattle and hogs for market.

The area available for the cultivation of cassava in Hawaii is very large. It is a crop which does not require large investment for the purely field operations of plowing, planting, cultivating and harvesting the crop. So far as recorded, cassava has never been grown under irrigation and does not require it; in fact, on the contrary, it is often stated that irrigation is detrimental. It has also been extensively grown without the use of fertilizers, although where large plantings are to be made for the purpose of converting the product into starch, glucose or cassava meal, the use of fertilizers and more cultivation will undoubtedly prove profitable.

If cassava is to be grown for starch production, the common practice of all other countries where this crop is cultivated indicate that the roots should be harvested not later than nine or ten months after the seed is placed in the ground.

In Jamaica³ the average cost of cultivation of cassava is estimated at about \$20 per acre, excluding rent, taxes, interest and

²U. S. Dept. Agriculture, Farmers' Bulletin No. 167.

³Bul. Dept. Agric. Jan. 2, 1903.

management, and eight tons per acre is considered a usual yield. The statement is made that where dry meal is made from the roots for shipment to glucose factories in England, the Jamaica growers receive a profit of from \$34 to \$44 per acre, and that there is a profit of from \$40 to \$50 per acre where the fresh roots are sold to starch factories, at \$10 per ton.

The average yield per acre in Florida is less than in Jamaica, four to six tons, and the factory price of the roots is about the same. Hawaiian conditions of soil and climate are more similar to those of the West Indies than Florida. Our soils are richer and the growing season continuous, so that the yields per acre will average above those obtained in Florida.

The size and capacity of a starch or glucose factory will govern the cost of production. A factory capable of turning out 10,000 tons of starch per annum can be operated more cheaply than ten factories of 1000 tons capacity. However, the size of factories will depend on the areas that can be devoted to this crop.

The yield of starch per acre from cassava can be counted on to average 50% greater than from corn. At an average yield of five tons per acre, which is probably lower than the average in Hawaii, the yield of starch would amount to 2500 pounds. At eight tons of roots per acre, the yield should be 4000 pounds. If the fresh cassava roots are utilized in the manufacture of glucose instead of starch, the product should be about 30% of the weight of the roots, or 3000 pounds of glucose from five tons of roots, or 4800 pounds from eight tons. The cost of glucose manufacture is less than of starch manufacture, in that it requires a smaller investment for buildings and plant. Commercially, glucose is sold in barrels of about 600 pounds weight. Its average value is about 1 cent less per pound than for raw sugar. San Francisco prices from 1893 to 1905 have ranged from $2\frac{1}{2}$ to $3\frac{1}{4}$ cents per pound. The lower price received for glucose and the larger investment required for the manufacture of starch make the total value per acre about the same, whether the cassava roots are converted either into glucose or starch. At $2\frac{1}{2}$ cents per pound for glucose and 3 cents per pound for starch, the product from an acre of cassava would be worth about \$75 for a five-ton yield and about \$120 for an eight-ton yield. Sulphuric acid, which is used in the manufacture of glucose, is now being manufactured in Honolulu and can undoubtedly be figured at as low a price as on the mainland. The third alternative would be to mill the fresh roots without attempting to separate the starch, dry the crude meal and ship it to the mainland markets for the production of glucose there. The advantage of this would be that very much less capital would be required than for the manufacture in Hawaii of either starch or glucose.

The starch which is now being manufactured in Hawaii by the crude Chinese methods, with very simple machinery, has not

proved to be salable in large quantities at a sufficiently high price to make the industry profitable. A certain amount of crude pia starch is consumed in the local market; shipments have also been occasionally made to San Francisco and New York. As stated above, the cotton spinning industry is the chief consumer of starch. Cotton threads must be treated with a "size," made from starch or some other cheap material of similar properties, before the threads can be woven. The function of the size is to fasten down the loose ends of the cotton fibers so as to make the thread of uniform smoothness. Manufacturers of cotton goods use a formula requiring starch of a certain density and chemical reaction. Some manufacturers use only alkali starch, others require acid starch. The alkalinity or the acidity of the starch depends on whether alkalis or acids have been used in the bleaching and purifying processes. Starches prepared by the crude Oriental or Chinese methods lack uniformity and are neither markedly acid nor alkaline, so that unless the product is offered in large enough amount so that it will pay the manufacturer of cotton goods to adapt his formulas to starch of this neutral character, the crude starch prepared in this way must be sold at less than the customary market prices. In other words, products must conform to market standards if they are to command the market price. If Hawaii can produce an alkali or an acid starch comparable in quality with the starches produced in other countries the market should be unlimited.

JARED G. SMITH.

*THIRD REPORT OF THE BOARD OF COMMISSIONERS
OF AGRICULTURE AND FORESTRY OF THE
TERRITORY OF HAWAII, FOR THE YEAR ENDING
DECEMBER 31, 1906.*

The above report has recently been issued and has been widely distributed throughout the Territory. It contains a comprehensive account of the various divisions of the board for last year.

DIVISION OF FORESTRY.

The personnel of this division has been substantially the same as last year, Mr. Ralph S. Hosmer continuing as superintendent. During the summer Mr. C. S. Judd of the School of Forestry at Yale University was associated with this division, his work centering at Lihue, Kauai.

Seven new forest reserves have been established during the year, containing an area of upwards a hundred and twenty-five thousand acres. The Territory now possesses twelve reserves of a total area of over a third of a million acres. Upon the suggestion of the Superintendent of Forestry, the Commissioners have included in the recommendation for appropriations a sum

sufficient to establish a ranger service throughout the reserves. Although only a small force can at present be secured, it is hoped that the necessity of this service will in future permit of enlargement.

During the year the policy of forest extension has been actively pursued, both in assisting the establishment of plantations and in the distribution of trees and seeds. Experiments have also been continued in the cultivation of rubber-producing trees, and tests made to ascertain the best conditions for their growth. No serious fires have been reported during the year.

DIVISION OF ENTOMOLOGY.

This division continues under the charge of Mr. Alexander Craw, Messrs. Koebele and Kotinsky being consulting and assistant entomologists respectively. Mr. G. A. Jordan has succeeded Mr. C. J. Austin as assistant inspector, and Brother Matthias Newell has been appointed inspector for the port of Hilo.

Much important work has been done in rigorous inspection of freight, and through timely action the Territory has been spared the importation of many obnoxious pests. Through the courtesy of the Federal officials a fumigating apparatus has been installed at the Honolulu postoffice for the chemical treatment of imported mail matter. Fumigatories have also been established at the Hilo dock and postoffice, and three others on various Honolulu wharves. The division is therefore well equipped for treating shipments.

The work of breeding and distributing beneficial insects has progressed successfully and special attention has been paid to establishing enemies of the horn fly, the avocado pear scale and of cut worms. The diminution of the horn fly will be much appreciated by the island cattle breeders.

Numerous changes in the buildings at the Nursery have facilitated the scientific work of the division. The installation of a modern equipment for microscopic study and of photographic apparatus will assist materially in this department of the work.

DIVISION OF ANIMAL INDUSTRY.

Dr. V. A. Nørgaard has continued superintendent of this division, assisted by Dr. J. C. Fitzgerald. Dr. Elliot has officiated as animal inspector at Hilo. Much of the year's work has been occupied in inspecting animals imported to the Islands. Those affected with suspicious symptoms are treated at the quarantine station at Kalihi, where facilities for a proper examination are at hand.

Various visits have been made to the different islands to definitely determine the prevalence of glanders, which is the most serious disease affecting horses in the Hawaiian Islands. The

most efficient way to stamp out the disease is by slaughter of the affected animals. Difficulties are encountered in this respect because of the inclination of many of the Oriental owners to hide animals showing indications of the disease.

Much attention has also been given to the eradication of "Scabies," and satisfactory progress has been made in the control of this disease. Owners of dogs will take much interest in the efforts made tending to the destruction of the insidious heart-worm of these animals.

The availability of the services of the Territorial Veterinarian, by the stock owners and others who may require his advice, has been made use of and much assistance has been given in this direction.

DIVISION OF AGRICULTURE.

Mr. Jared G. Smith, Director of the Federal Agricultural Experiment Station, has been in charge of this division, which has devoted its experiments largely to continuing its work in establishing the tobacco industry in Hawaii.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

Mr. Hosmer's report to the Commissioners enters fully into the work of the division for the year. A noteworthy feature is the introduction of a series of maps of the various islands which graphically illustrate the forest reserve system which has been established. The Hawaiian reserves consist of three classes of land, viz.: government land, not leased; leased government land; and land in private, fee simple ownership. The report contains many carefully-prepared tables analysing the lands of the various islands under the above classes.

To permanently mark the forest reserve boundaries, metallic monuments have been established, consisting of two galvanized iron pipes, each $4\frac{1}{2}$ feet long and $2\frac{1}{2}$ and 3 inches, respectively, in diameter. The smaller pipe is set in the ground; the larger one, fitting over it, is secured by a bolt fastened by a brass railway switch padlock. The upper pipe carries a metal target, with the letters: F. R. T. H. (Forest Reserve, Territory of Hawaii). When set in place the monument is given a coat of white enamel paint. The detachable upper pipe permits the use of the point as a station in survey work. During 1906, sixty-nine of these monuments have been established.

The collection of seed of all the more important native and introduced trees has been systematically carried on for selling at very moderate prices. An important development has taken place in the introduction of the seed of new and little known exotic plants. The introduction of new trees is one of the most important lines of work yet to be taken up in Hawaiian forestry.

In compliance with the appropriation for experimenting in growing rubber trees on Government forest lands, and in response to a general demand for information upon questions of rubber cultivation, systematic work has been carried on in this work during the year. The most important question in connection with the establishment of the rubber industry in the Islands is whether the trees will yield rubber in commercial quantities. This is, of course, the vital point to be determined, and until it has been demonstrated satisfactorily the industry must remain in an experimental stage. The existence in the Islands of two groves of Ceara rubber trees of a sufficient size for tapping is very fortunate, and experiments will soon be conducted under the joint direction of the Division of Forestry and the Federal Agricultural Experiment Station to determine the production of lac.

One of the important events of the year relating to forest work near Honolulu has been the progress towards the acquisition by the Territory of the Coney Estate property on Tantalus, upon which is the largest part of the eucalyptus forest.

During the year several publications have been issued by the division which have been widely circulated.

An interesting feature of 1906 has been the organization of two koa lumbering companies on the Island of Hawaii. Actual work has not yet commenced, but both companies have commenced preliminary steps for logging in the near future.

During 1907 it is intended actively to pursue the policy already laid down in the past year. The creation of forest reserves will continue until the chain of projected reserves is established. Coöperation with private owners will also be undertaken in tree planting and in stimulating the movement where it already exists.

REPORT OF FOREST NURSERYMAN.

Mr. Haugs submits a lengthy report upon the work at the Government Nursery, the Nuuanu Station and the Tantalus Forest. Extensive assistance has been given to private owners in the matter of growing and caring for trees. Much valuable information has also been imparted to visitors who have come to the Nursery for advice. Nineteen special visits have been taken to outside points at the invitation of private persons for the purpose of consultation as to establishing a system of tree planting. In each instance plans have been made to fulfill the requirements of the particular case.

Following Mr. Haugs' report are the minor ones of the District Foresters. These together occupy nearly fifty pages.

The report of the Librarian concludes the part of the publication relating to the Division of Forestry. The use of the library room for the meetings of other organizations has been largely

resorted to, and altogether forty-eight evening meetings have taken place during the year. From this use, the Board gains the advantage of bringing the public in touch with its diversified work.

DIVISION OF ENTOMOLOGY.

Mr. Alexander Craw's report describes in detail the precautionary measures which have been taken to exclude insect pests from the Territory. Descriptions are also given of the local inspection work and the steps which are being taken to exterminate pests which have already asserted themselves. Noteworthy among these are the mango weevils and scale insects.

The introduction, breeding and distribution of beneficial insects has been in charge of Mr. Jacob Kotinsky, under whom admirable work has been done. By far the largest and most numerous consignments of beneficial insects were enemies of the horn flies. Enemies of scale bugs, plant lice and army worms also are described and appropriately illustrated. Time alone will show the result of the release of these various insects. This result, however, it is satisfactory to know, can only either be positive or neutral, depending upon whether or not the insects establish themselves and how rapidly they increase. No evil effects need be apprehended, because all those released are either predaceous or parasitic, and no insect has been known to abandon a carnivorous for vegetarian diet.

The beneficial insects have been sent by Mr. A. Koebele from California and Arizona, by Mr. E. M. Ehrhorn, also from California, by Mr. F. Muir from Fiji, and by Mr. G. Compere from China and Japan.

Mr. Koebele's report is appended to that of Mr. Alexander Craw's. It contains field notes on enemies of the alligator pear scale, horn fly and other insects sent to Honolulu throughout the year.

DIVISION OF ANIMAL INDUSTRY.

Dr. Nörgaard's report will be found of particular interest to breeders of the different classes of live stock. The regulations governing the importation of animals have proved effective and the local representative of the United States Bureau of Animal Industry in San Francisco has signified his willingness to inspect all stock intended for shipment to the Islands. The great value of this assistance will be the prevention of shipment of affected animals, which will greatly reduce the danger of the importation of disease.

Various animal diseases are described, their occurrence in the Islands reported, and steps for control explained.

A new branch of investigation is now being conducted by the division. The great difficulty of keeping valuable dogs immune from the heart worm prevalent in the Islands has rendered the matter sufficiently important to receive special attention. The worm is transmitted by means of mosquitoes, and as yet no remedy has been discovered to alleviate the sufferings of affected animals.

DIVISION OF AGRICULTURE.

Mr. Jared G. Smith in his report shows in what manner the Territorial appropriations have been expended for this branch of the work. The tobacco field experiments have been so far successful that it does not seem necessary to continue them on a large scale, but many points connected with curing, fermenting and sorting of tobacco require further investigation. It is now proven conclusively that a tobacco of good burning qualities, texture, flavor and color can be produced on a commercial scale and at remunerative profit.

The work with Bluefields bananas has been conducted. One thousand suckers have been distributed and the plants are now so widely circulated that their propagation by the Station on a large scale is no longer necessary.

The Station has also successfully conducted a demonstration of the fact that papayas and alligator pears can be shipped to the mainland without loss in transit, and that a market for \$500,000 of these fruits is waiting the Hawaiian grower. This part of the work has been performed by Mr. Higgins, who has made an extensive study of market conditions on the Pacific Coast.

(The above publication, consisting of 212 pages and illustrations, can be obtained free by application to the Mailing Clerk, Box 331, Honolulu, Hawaii.)

A MODERN AGRICULTURAL COLLEGE.

We have received a most attractive syllabus from the Department of Forestry of the Iowa State College. The publication is excellently illustrated and is a very useful guide as to the scope of the work of an agricultural educational establishment equipped with modern facilities and presided over by men actuated with the spirit of modern science. The College is now engaged in the construction of a new building specially devoted to the science of agriculture. The object aimed at by the Division of Agriculture of the College is to furnish a good foundation from which a student may become either a successful practical farmer or may develop into a specialist in any one of the branches of agricultural industry. Agronomy, the science of the field and its crops, including the study of soil, farm crops and agricultural engineering,

is essentially the main domain of the tiller of the soil, and will constitute a special department of the Division of Agriculture. The Department of Animal Husbandry, embracing everything pertaining to the judging, selection, breeding, feeding, development, care and management of various breeds of domesticated animals, will also undertake the special work outlined above. The Department of Horticulture and Forestry will offer excellent opportunities for the observation and study of these branches of agriculture. For this purpose 5000 square feet of greenhouses and forty acres of orchards and gardens are in cultivation, enabling the student to observe varieties, modes of culture and the adaptability to local soil and climatic conditions. The work of the Dairy Department is designed to give a knowledge of the science and practice of dairying. The course will fit students to become instructors, investigators and inspectors, managers of dairy establishments, cheese factories, creameries, market milk plants and condenseries. It will cover the economic production of milk and the processes relating to the marketing of butter. Attached to the division will also be an Agricultural Experiment Station to investigate questions having a practical relation to successful agriculture. The experimental investigation will involve the study of various fodders, grasses and grains, the methods of their cultivation and improvement, the moisture and fertility of the soil, the feeding of domestic animals, the problems of butter and cheese making, bacteriological investigation, fruit growing, spraying, fertilizing and pruning. A course of veterinary medicine will also afford opportunities for the study of anatomy, pharmacy, bacteriology, histology and pathology, in relation to the comprehensive science of agriculture. A full course at the Iowa State College should be of inestimable worth to a youth purposing to engage in the practice of any one of the various branches of husbandry. The State of Iowa is by no means alone in the facilities which it offers to the prospective farmer, and in its recognition of the importance to the welfare and stability of the country of this member of the body politic.

THE NEW LAWS.

Following the policy of keeping its readers in close touch with events of agricultural interest in the Territory, the Forester begins this month to print the Acts passed at the present session of the Territorial Legislature that have to do with agriculture in one or another of its many phases. Editorial comment on certain of the new laws may be looked for in subsequent issues.

BY AUTHORITY.

ACT 4.

AN ACT

TO AMEND SECTION 379 OF CHAPTER 28 OF THE REVISED LAWS OF HAWAII, AS AMENDED BY ACT 65 OF THE SESSION LAWS OF THE TERRITORY OF HAWAII, PASSED BY THE LEGISLATURE AT ITS REGULAR SESSION OF 1905, RELATING TO THE BOARD OF AGRICULTURE AND FORESTRY.

Be it Enacted by the Legislature of the Territory of Hawaii:

Section 1. Section 379 of the Revised Laws of Hawaii, as amended by Act 65 of the Session Laws of the Territory of Hawaii passed by the Legislature at its regular session of 1905, is hereby amended so as to read as follows:

"Section 379. The Governor may, with the approval of a majority of the Board, after a hearing or hearings as hereinafter provided, from time to time set apart any Government land or lands, whether under lease or not, as forest reservations, provided, however, that on lands under lease the reservation shall not take effect until the expiration of the existing lease, or in any way affect the rights acquired under the lease. Any land or lands while so set apart shall not be leased or sold by the Government or used in any way for any purposes inconsistent with this Act; provided, however, that the Governor may from time to time, with the approval of the Commissioner of Public Lands, after a hearing or hearings as hereinafter provided, revoke, modify or suspend any and all the orders and proclamations, or any part thereof, which set apart such lands."

Section 2. This Act shall take effect from and after the date of its approval.

Approved this 5th day of March, A. D. 1907.

G. R. CARTER,
Governor of the Territory of Hawaii.

ACT 5.

AN ACT

To ENCOURAGE DIVERSIFIED INDUSTRIES.

Be it Enacted by the Legislature of the Territory of Hawaii:

Section 1. For five years from and after January 1, 1908, all property solely and actually used in the production of grapes for the manufacture of wine for commercial purposes shall be exempt from property taxes, but such exemption shall be allowed only to any person, firm or corporation in respect of land in actual vine

cultivation, not exceeding twenty acres in the case of any one holding, or to the extent of twenty acres where any holding exceeds twenty acres.

In order to secure such exemption the land in respect whereof such exemption is claimed must be fenced and actually under cultivation prior to the first day of January of the year in which such exemption is claimed.

Section 2. This Act shall take effect from and after the date of its approval.

Approved this 11th day of March, A. D. 1907.

G. R. CARTER,
Governor of the Territory of Hawaii.

ACT 24.

AN ACT

TO ESTABLISH THE COLLEGE OF AGRICULTURE AND MECHANIC ARTS OF THE TERRITORY OF HAWAII, AND TO PROVIDE FOR THE GOVERNMENT AND SUPPORT THEREOF.

Be it Enacted by the Legislature of the Territory of Hawaii:

Section 1. The Governor shall nominate and by and with the advice and consent of the Senate shall appoint five persons, who shall constitute the Board of Regents of the College of Agriculture and Mechanic Arts of the Territory of Hawaii, which is hereby established.

Section 2. The persons appointed in accordance with Section 1 of this Act shall be residents of the Territory of Hawaii and not less than 25 years of age. One member of the Board of Regents shall be appointed for the term of one year, two for two years, and two for three years, and their successors shall thereafter be appointed for the term of four years.

Section 3. The Board of Regents shall have the general management and control of the affairs of the College. They shall have power to purchase or otherwise acquire lands, buildings, appliances and other property for the purposes of the College and expend such sums of money as may be from time to time placed at the disposal of the College from whatever source. All lands, buildings, appliances and other property so purchased or acquired shall be and remain the property of the Territory of Hawaii, to be used in perpetuity for the benefit of the College.

Section 4. The purposes of the College are to give thorough instruction in agriculture, mechanic arts and the natural science connected therewith, and such instruction in other branches of advanced learning as the Board of Regents may from time to time prescribe, and to give such military instruction as the Federal Government may require. The standard of instruction in

each course shall be equal to that given and required by similar colleges on the mainland, and upon the successful completion of the prescribed course the Board of Regents are authorized to confer a corresponding degree upon all students who shall become entitled thereto.

Section 5. No person shall, because of age, sex, color or nationality, be deprived of the privileges of this institution.

Section 6. The Faculty of the College shall be under the direction of a President, who shall be appointed by the Board of Regents. The members of the Faculty shall be likewise appointed.

Section 7. The official name of the Board of Regents shall be Board of Regents, College of Hawaii, and the Board shall adopt and use a common seal, by which all official acts shall be authenticated.

Section 8. The Board of Regents shall have the authority to sue in its official name and shall be subject to be sued only in the manner provided for suits against the Territory of Hawaii.

Section 9. The Treasurer of the Territory is hereby authorized to pay from time to time to the Board of Regents, upon their receipted vouchers, such sums as may be available. The Board of Regents shall cause to be kept suitable books of account and shall submit to each session of the Legislature a statement showing the total receipts and expenditures.

Section 10. This Act shall take effect from and after the date of approval.

Approved this 25th day of March, A. D. 1907.

G. R. CARTER,
Governor of the Territory of Hawaii.

ACT 104.

AN ACT

To PROVIDE FOR THE PROTECTION OF BIRDS BENEFICIAL TO THE FORESTS OF THE TERRITORY OF HAWAII AND TO DEFINE THE SAME.

Be it Enacted by the Legislature of the Territory of Hawaii:

Section 1.—For the purpose of this Act, Hawaiian geese (nene) and all perching birds (scientifically known as Passerine) that frequent the forests of this Territory shall be considered as beneficial, except such as are specified in Section 2.

Section 2. The European or house sparrow, the house finch, the rice bird, the mynah, the native crow or alala and any im-

ported species of perching bird (or Passerine), (injurious to forestry or agriculture) shall not be protected by this Act.

Section 3. It shall be unlawful for any person to catch or kill any perching bird (or Passerine) other than those specified in Section 2, or to have in his or her possession the body of any such bird, or to take, destroy or have in possession the nest or eggs of any such bird.

Section 4. Any person violating this Act shall be guilty of a misdemeanor and on conviction shall be fined Ten Dollars (\$10.00) for each offense, and Fifty Dollars (\$50.00) for each perching bird (or Passerine) killed or caught, other than those specified in Section 2, or for each body or part of the body of such bird that he or she has in possession, or for each nest or egg of such bird as is destroyed or possessed in violation of this Act; or shall be liable to imprisonment for two weeks or to both fine and imprisonment at the discretion of the court; provided, however, that the preceding sections of this Act shall not apply to any person holding a permit, issued in accordance with the provisions of the next Section of this Act, giving him or her the right to collect any species of perching bird (or Passerine), their eggs or nests for scientific purposes only, unless such person shall violate the conditions of such permit.

Section 5. To any person who shall furnish satisfactory evidence that he or she is a duly authorized agent of some scientific institution and is collecting birds, their nests or eggs, for such institution, or for private scientific study and not for sale, the Commissioners of Agriculture and Forestry of this Territory, or such agent as they appoint, may issue a permit to collect for such scientific purposes, a limited number of any species of perching birds (or Passerine), (the number of each and any species that may be caught or killed being stated by the aforesaid Commissioner of Agriculture and Forestry or the agent appointed by them), at any time between and including the first day of October and the last day of February next following, but at no other time whatsoever.

Section 6. Any person to whom such permit to collect perching birds (or Passerine), their eggs or nests shall be issued, shall file with the Commissioners of Agriculture and Forestry, or their agent, a good and sufficient bond to the Territory of Hawaii in the sum of Two Hundred Dollars (\$200.00), with two responsible citizens of this Territory as sureties, conditioned that if the holder of said permit shall be convicted of violation of any of the provisions of this Act, or of those of the permit issued to him or her, the said bond shall be forfeited.

Section 7. The applicant to whom a permit to collect perching birds (or Passerine) is issued, shall pay a fee of One Dollar (\$1.00) to defray the expense of such permit, said permit to bear the name and post office address of the holder, a copy of this

Act, to which the holder shall attach his or her signature, and a list showing the greatest number of each species of perching bird that may be killed or caught by the holder of the permit; said permit is not transferable and holds good only for one season, i. e., from the first of October to the last day of February next following.

Section 8. In all proceedings against any person for violating the provisions of this Act, such person shall be deemed to be without the permit herein provided for unless he shall produce the same.

Section 9. All Acts and parts of Acts inconsistent with this Act are hereby repealed.

Section 10. This Act shall take effect from and after the date of its approval.

Approved this 25th day of April, A. D. 1907.

G. R. CARTER,
Governor of the Territory of Hawaii.

ACT 69.

AN ACT

TO AMEND CHAPTER 28 OF THE REVISED LAWS OF HAWAII BY
ADDING TO SAID CHAPTER A SECTION TO BE KNOWN AS
SECTION 389A.

Be it Enacted by the Legislature of the Territory of Hawaii:

Section 1. Chapter 28 of the Revised Laws of Hawaii is hereby amended by adding a new section thereto to be known as Section 389A and to read as follows:

"Section 389A. It shall be the duty of the Board to make rules and regulations, and to amend the same from time to time, in its discretion, subject to the approval of the Governor, for and concerning the importation into the Territory of bees and for the preservation, protection and improvement of bees now within the Territory; and for the quarantine, inspection, fumigation, disinfection, exclusion or destruction either upon importation into the Territory or at any time or place within the Territory of any bees and any box or other container and their contents in which bees have been imported or contained, which is or may be infested with or liable to assist in the transmission or dissemination of any insect or disease injurious to bees. All rules and regulations made as aforesaid shall have the force and effect of law. It shall be the duty of the Board to establish an observational apiary and all bees imported into the Territory shall be

there quarantined free of cost to the owners until such time shall have elapsed as to enable the proper entomologist or inspector of the Board, to certify to the owners that such bees are clean and free from disease. The entomologists or inspectors of the Board may enter upon the premises of any bee keeper for the purpose of inspecting apiaries, and of carrying out the orders of the Board and they shall not be holden guilty of any misdemeanor by so doing nor shall they be personally liable in damages except for acts beyond the scope of their authority or due to their own negligence.

Section 2. This Act shall take effect from and after the date of its approval.

Approved this 17th day of April, A. D. 1907.

G. R. CARTER,
Governor of the Territory of Hawaii.

WORK ON HAWAIIAN FRUIT.

Volume I of Mr. Gerrit P. Wilder's work upon the fruits of our islands has recently been issued. It is an extremely interesting publication and will be noticed at length next month.

THE MAY FORESTER.

The Forester for May is well in hand and will be published shortly. It contains, besides other matter, an exceptionally important paper by Dr. Cobb upon the diseases of pineapples. We would advise growers of this fruit to secure any extra copies they may require as early as possible. We anticipate a large demand for the May number and it will probably be difficult to obtain it, in a short time.

~ PINEAPPLE NUMBER ~

VOL. IV

MAY, 1907

No. 5

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NOTICE FROM THE DIVISION OF ENTOMOLOGY

The Entomological Division of this Board wishes to inform Hawaiian readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER & AGRICULTURIST

VOL IV.

MAY, 1907

No. 5

The Forester takes great pleasure in presenting this month an able paper by Dr. N. A. Cobb upon the present status of the Hawaiian pineapple industry with regard to threatened fungoid and insect pests. The wide experience of the writer, not only with regard to the special industry which his article touches, but also in general plant pathology and crop technology, entitles his conclusions to great attention and renders them authoritative. It is to be sincerely hoped that the rapidly growing pineapple industry of Hawaii will long continue its prosperous course and will successfully solve as they arise, those problems which must be expected from time to time to threaten its well being. In this, as in all tropical agricultural enterprises, success can only be achieved by constant vigilance and by the prompt application of scientific remedies. To this end we would urgently direct all pineapple growers in the Territory to a careful consideration of Dr. Cobb's paper.

MEETING OF THE BOARD OF AGRICULTURE AND FORESTRY.

At the meeting of the Board of Agriculture and Forestry, held on April 3 last, the following Commissioners were present: Messrs. W. M. Giffard, C. S. Holloway, secretary, A. W. Carter and Gerrit P. Wilder. In the absence of Mr. Thurston, Mr. W. M. Giffard presided.

Messrs. R. S. Hosmer, Superintendent of Forestry; Jared G. Smith, Special Agent in Charge of the Federal Experiment Station; Alexander Craw, Superintendent of Entomology; Jacob Kotinsky, Assistant Entomologist, and Dr. J. C. Fitzgerald, Assistant Veterinarian, were in attendance.

At the close of the introductory business, Mr. Giffard, in expressing regret at the resignation of Mr. Thurston from the presidency of the Board, suggested the desirability of electing a successor. In the discussion which ensued, Messrs. Carter and Wilder advised deferring action in this matter until the two recently-appointed members of the Board, Messrs. Paul R. Isenberg and L. G. Kellogg, who were both absent from Honolulu, could be present. This course was finally adopted. Mr. Carter, in

speaking of the work of the former president of the Board, said substantially as follows: "I wish to record my appreciation of Mr. Thurston's work in connection with the Board of Agriculture both as a member and as its president. It was greatly through his action that its organization was perfected, and the bill which created it was drafted with his coöperation. Through his energy and the quality of his work, the duties of the other members of the Board have been greatly lightened, and it is only fitting that at the close of his tenure of office suitable recognition of this should be had. I therefore move that the secretary be instructed to write to Mr. Thurston a letter of appreciation of his services."

The motion was unanimously carried.

VARIOUS REPORTS.

Mr. Hosmer reported the resignation of Byron O. Clark as fire warden at Wahiawa, on account of his change of residence and recommended A. M. Nowell as his successor. The recommendation was adopted.

The resignation of Thomas S. Kay as fire warden of North Kohala was also reported. Mr. Kay recommended George C. Watt, manager of Kohala Sugar Co., as his successor. Mr. Hosmer endorsed the nomination and the meeting appointed Mr. Watt.

Mr. Hosmer submitted a report from Charles L. Judd, of the Yale forestry school, on his work at Lihue last summer, and also a thesis by the same author. The report was very creditable, Mr. Hosmer said, and he proposed to prepare a bulletin of some of its contents.

Mr. Holloway now read a letter from George C. Munro regarding his investigations of forage plants on the Island of Molokai. Mr. Munro offered to furnish a special article on the subject for the Hawaiian Forester and Agriculturist, or for a departmental bulletin. His recent visit to New Zealand, his native country, was mentioned as having increased his knowledge upon forage plants.

Mr. Smith, in the course of a general discussion on the offer, said he had seen the article and from a cursory perusal thought it a useful paper.

It was voted to refer Mr. Munro to the editor of the Agriculturist.

Dr. Fitzgerald orally reported the slaughter of ten horses, previously branded for glanders, at the Moiliili rice plantation; and also another outbreak of glanders at another place in the same locality. Dr. Nörgaard, the head veterinarian, had gone to Maui at the request of Alexander & Baldwin. Dr. Fitzgerald also told of the work of the division relative to mangy dogs.

Mr. Smith spoke of the increase in the Federal appropriation for State and Territorial agricultural colleges to \$30,000 a year,

under a plan of increasing it until it reaches \$50,000 as the annual subsidy for each of such institutions. He further stated that the station entomologist, Mr. Van Dine, would leave for Washington this week to confer with the department officials on the honey standard. They expected him to bring back some Cyprian and Carniolan queen bees. It was hoped he might attend the National Anti-Mosquito Association meeting in New York.

Mr. Smith referred to Dr. Nörgaard's investigations in search of the sheep pest (the screw worm) and the cattle pest (the horn fly), but Mr. Giffard, as chairman of the entomology committee, will report fully on this matter later. It may be mentioned, however, that a parasite to destroy the horn fly, imported by Prof. Koebele in 1898, seems to be doing its work well.

The Federal station was continuing rubber experiments. Those in tobacco culture were exhausted, but Mr. Smith had some bales of merchantable leaf tobacco on hand besides samples sent to New York.

Mr. Carter stated that about 700 fruit trees had been planted on the Island of Hawaii, and Mr. Higgins had been sent from the Federal station to superintend the cultivation. The list comprised, among other trees, apples, peaches, pears, apricots and plums.

Mr. Alexander Craw, Superintendent of Entomology, reported on the examination of mail matter and freight for the detection of insect pests.

With the passing of some minor expense bills the routine business was finished and the meeting adjourned.

BOARD OF AGRICULTURE AND FORESTRY.

DIVISION OF FORESTRY.

ROUTINE REPORTS.

At the meeting of the Board held on April 3, 1907, the following routine reports of the Division of Forestry were read, accepted and ordered placed on file:

November 28, 1906.

Board of Commissioners of
Agriculture and Forestry,
Honolulu.

Gentlemen: I beg to submit the following report covering the routine work of the Division of Forestry from October 31 to date:

During this period I have been in the office in Honolulu, engaged with the preparation of reports and other details in con-

nnection with the creation of proposed forest reserves on Oahu, Hawaii and Kauai, with correspondence in regard to the library, with the gathering of material preliminary to the preparation of the annual report of the Division of Forestry for 1906, and with the regular routine work of the division.

On November 2, Arbor Day, I spoke to the pupils of the Honolulu High School on "Forestry in the United States," and on November 21 I appeared before the Hawaiian Sugar Planters' Association to read a report supplementing that of the association's Committee on Forestry regarding the work of this Division, and the progress of forestry in the Territory during the past year.

On November 12 the final papers were signed in the agreement whereby Messrs. Alexander & Baldwin turn over to the management of the Board of Agriculture and Forestry the area of privately owned land within the Koolau forest reserve on Maui. This, with the government land in the reserve, under lease to Alexander & Baldwin, approximates 27,000 acres. The consummation of this transfer I believe to be one of the most important steps that has yet been taken in the forest movement in Hawaii, in that it marks the real beginning of a closer coöperation of forest owners with the Government in the systematic management of their forest properties.

During the past month the annual report of the Board for 1905 has been widely distributed throughout the Territory. Reports have also been sent to a carefully selected list of foreign exchanges.

On November 14 there was issued Press Bulletin No. 4 of the Division of Forestry, entitled "Instructions for Propagating and Planting Forest Trees," by David Haughs; 4 pp., 1000 copies.

Arbor Day, November 2, was generally observed in the schools throughout the Territory. Mr. Haughs' report shows that a total of 2580 plants were furnished free for this purpose from the Government Nursery, as against 3554 for 1905. As was the case last year, the freight charges were paid by the Department of Public Instruction.

A number of important accessions in the way of botanical and entomological books have recently been received by the board library. A list of the new books will be given in an early report.

The library room of the Board has been used during the month by other organizations as follows: Hawaiian Entomological Society, November 1; Poultry Association, November 13 and 21; Palolo Improvement Club, November 23.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

December 6, 1906.

Board of Commissioners of
Agriculture and Forestry,
Honolulu.

Gentlemen: I beg to submit the following report covering the routine work of the Division of Forestry from November 28 to date:

During this period I have been in the office in Honolulu engaged in the preparation of material for the next annual report of the division and with routine work; excepting that on Tuesday last I visited the land of Honouliuli, on this island, in company with Messrs. H. M. von Holt and O. L. Sorenson of the Survey Department, to determine the location of a portion of the boundary of the proposed forest reserve on that land. This project I shall report on to the board in the near future.

On Wednesday last Mr. Haugs visited the land of Waipio, District of Ewa, on this island, to draw up a planting plan to be followed by the Ii Estate in planting a portion of that land.

The library room of the Board has been used once during the week, for a meeting of the Honolulu Improvement Advisory Board, which was held on Friday, November 30.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

April 3, 1907.

Board of Commissioners of
Agriculture and Forestry,
Honolulu.

Gentlemen: I have the honor to submit the following report covering the routine work of the Division of Forestry from December 6, 1906, to date:

ANNUAL REPORT.

During the greater part of this period the staff of the Division of Forestry has been occupied with routine work of various kinds. During the month of December, both Mr. Haugs and I were busy with the compilation and preparation of the annual report of the Division of Forestry. Although the first installment of copy was turned over to the printer early in January, during the whole of that month much time was spent on the report, both in

reading proof and in attending to details in connection with its publication. And in February also, when the complete report was actually in press, not a little of my own time was spent in seeing the minor details contributing to its correctness were attended to.

The report was finally issued on February 28, when about 200 copies were received from the printer and distributed to the members of the Legislature, Territorial officials and persons in one way or another connected with the Board. The full edition of the main report consisted of 2500 copies. There have also been printed separates, containing the reports of the several divisions, five hundred each. The main report has been widely distributed throughout the Territory and to addresses on the foreign mailing list of the Board.

ROUTINE WORK.

Some of the most important routine matters connected with the Board have been the preparation of estimates for the coming fiscal period and other financial statements having to do with the re-segregation of the appropriation for the present period. During the last four months, while I have been in Honolulu, I have been able to take care of much routine detail in connection with the library and other matters concerning the Board and the Division of Forestry. Much of this work leaves little to show for the time put into it, but were it not done the effect would be very apparent.

REPORT OF THE FOREST NURSERYMAN.

Mr. Haugs' report tells of his activities since the first of December. I may repeat that during this time he has prepared five planting plans for as many individuals or corporations. This work has necessitated one trip to the Island of Hawaii, one to the Island of Maui, and two to points out of Honolulu on this island. The collection of seed from forest trees in the vicinity of Honolulu has gone on as opportunity offered and a number of shipments of foreign seed have been received from different correspondents of the division. A considerable number of packages of Hawaiian seed have been sent out in exchange to botanic gardens and to persons on our Exchange List. This list is constantly being enlarged.

CONGRESSIONAL SEED.

During the past two months the 1906 quota of Congressional vegetable and flower seed forwarded to this office by the Delegate to Congress, Hon. J. K. Kalanianaole, has been distributed to

the schools maintaining school gardens and to persons applying under an offer published in the various newspapers.

LIRRARY.

The Library of the Board has received a number of important accessions through purchase since my last report, in the way of forestry, botanical and entomological books. The serial publications regularly received have also been increased since the first of the year by the addition of a number of magazines not heretofore taken. As has been said many times before, both the books and the periodicals are open to the public for reference, daily, during office hours.

I am glad to report that since the first of the year the number of persons per month who consult the library has been larger than in the past.

During January the Board building was painted, as was also the exhibit room containing the woods and fruits. Pursuant to action taken by the Board at an executive meeting held on January 8, the cottage in the Nursery grounds is now being put in shape for occupancy by the Forest Nurseryman.

LEGISLATION.

Since the beginning of the session of the present Legislature several acts have been passed that more or less directly affect this Board. Among these may be mentioned Act 4, to amend Chapter 28 of the Revised Laws so that forest land belonging to the Government may be set apart as forest reserves whether under lease or not. This is a law for which the Board has been working for some time. The Emergency Appropriation Bill contained an item of \$1500 for the use of this Board during the remainder of the present fiscal period. The other bills which less directly interest the Board are those providing for the remission of taxes on certain of the diversified industries and that creating an agricultural college.

FOREST FIRE SERVICE.

On February 9 a special warning notice for a period of twelve months was issued for the Tantalus section, and on March 19 a similar notice for a six months' period was issued for the upper part of the Waialua District, back of Wahiawa. I am glad to say that no forest fires have been reported this winter.

MEETINGS.

The use of the library room for evening meetings continues to

give satisfactory results. Since December the following organizations have made use of it:

Hawaiian Entomological Society, December 6, 1906; February 7, 1907.

Hawaiian Poultry Association, December 11, 1906; January 8, February 12 and March 12, 1907.

Honolulu Improvement Advisory Board, December 28, 1906; February 18 and March 15, 1907.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

April 3, 1907.

R. S. Hosmer, Esq.,
Superintendent of Forestry,
Honolulu.

Dear Sir: The following report gives the principal work done by the men employed by the Division of Forestry from December 4, 1906, to April 3, 1907:

CO-OPERATIVE PLANTING WORK.

During the period mentioned the writer has made one trip to Maui, one to Hawaii and two to places on Oahu outside of the District of Honolulu. Six places have been visited in the District of Honolulu at the request of parties asking for advice on different subjects connected with the growing and care of plants.

Reports and recommendations on the following places visited have been made and the applicants given a copy of each. The originals have been placed on file in this office.

December 12 and 13: Report with recommendations on the grounds and certain lands belonging to the Lahainaluna School, Maui.

February 8: Examination and report, with recommendations, on two tracts of land in the District of Puna, Hawaii, belonging to the Puna Sugar Company and known as "Kamaili tract" and "Keahealaka tract."

March 1: Report, with recommendations, on the reforesting of certain lands belonging to the Boys' Industrial School, Waialee, Oahu.

March 2: Report, with recommendations, on the reforesting

of part of what is known as the "Kawaiola tract," belonging to the Waialua plantation.

On March 26, at the request of Father Adelbert Rielander, a visit was made to the Catholic Mission lands in Kalihi Valley. A report on the lands is at present being prepared.

An application for advice and assistance on tree planting, etc., has been received from A. M. Nowell, manager of the Wahiawa Water Company. A visit to Wahiawa will be made in the near future.

THE COLLECTION AND DISTRIBUTION OF SEEDS.

The collection of seed has been continued. Over fifty full sets are being prepared for exchange purposes. These will be sent to botanic gardens, experiment stations and other institutions on our exchange list.

The consignment of vegetable and flower seeds received from the Hon. J. K. Kalanianaole are being gradually disposed of. Many applications are coming in from all over the Islands for same.

NURSERY AND SEED CATALOGUES.

A large assortment of nursery and seed catalogues is now on file in this office for the use of the general public. A communication was sent to the Gardener's Chronicle, London, stating that we would like to receive catalogues of the different nursery and seed firms in Great Britain. The communication was published in the above paper. Since then catalogues have been coming in from all over Europe. We have also on file catalogues of the leading firms in the United States, Australia, Japan and Ceylon.

THE NURSERY.

The work in the Nursery has been principally routine work. Preparations are being made to curb the principal walks. The narrow cross walks are being filled up and will be grassed over. Coral rock is being carted and the walks will be made similar to the one at the east side of the office.

NUUANU STATION.

Since the first of March only one man has been employed at the station. Keeping the trees clear of vines is the principal work.

Very truly yours,

DAVID HAUGHS,

Forest Nurseryman.

BOARD OF AGRICULTURE AND FORESTRY.**Division of Entomology..****PRINCIPAL CITRUS INSECTS IN HAWAII.**

BY JACOB KOTINSKY.

(Continued from last "Forester.")

NOXIOUS INSECTS.

Primarily the citrus insects may be grouped as either injurious or beneficial. To those not familiar with correlating the habits of insects with their appearance there are no ready external signs by means of which to differentiate the useful insects from the injurious ones. It becomes necessary therefore to familiarize ourselves with the appearance and habits of each species separately in order to learn to distinguish friend from foe. As the injurious insects require our first attention we will give them first consideration.

PURPLE SCALE (*Lepidosaphes pinnæformis*, Bouché).

No insect affecting citrus plants on these islands is more destructive to these plants. Checked but little by predaceous or parasitic enemies, the scale, once it secures lodgment upon a tree, multiplies rapidly and continues sapping its vitality until the tree is killed, unless some artificial remedy is applied.

Larva. The group of scale insects to which the purple scale belongs are rather peculiar in that through most of their lives their resemblance to an ordinary insect is very slight or not at all. When newly hatched the larvae bear six legs, a pair of antennae in front, and two rather long waxy filaments projecting behind, a pair of simple eyes and a short sucking beak. At this stage no known difference between the sexes exists, and it is the only period in the life of the female when she is not fixed to the host. In this condition the insect remains but two or three days in our climate, after which it attaches itself to the host, casts its skin and begins to build the scale over itself—its permanent home.

The female scale.—This consists mainly of waxy substance which as it grows older becomes hardened,—leathery or horny. In shape the scale is linear or mussel-shell-like, narrow in front where it consists of the two skins cast by the insect in course of growth and wider posteriorly. The first molt lies in front and overlaps the second, which is larger and already covered with considerable waxy matter. The scale proper then extends to the rear so that the entire scale is about 2.5 mm. (0.1 in.) long.

It seldom runs in a straight line, however, since in course of construction, if an obstacle is met, the line is deviated and the scale curves in one or more directions. Most often the scales occur in large numbers, and then they are piled in one on top of the other, sometimes three and more tiers deep, and then of course the curvature of the normally linear scale is almost universal. The surface of the scale is more or less marked by transverse lines, somewhat shiny, and in color brown of various shades, rarely purplish. The name "purple scale" comes from Florida, where it seems to be more purple than here, and because of the color of the male scales.

The male scale is about half as long as, narrower and more linear than that of the female. It has but one cast skin in front, and is rather purplish in color. In structure it is similar to that of the female scale.

Female.—With the first molt the insect is divested of its legs and antennae, leaving but a hair-like proboscis for absorbing food, and the body for carrying on the life processes. Virtually this body is but a sack which later in life becomes filled with eggs, and these laid, the insect dies and dries up where it first settled for life. This sex never develops wings.

Shortly after the second molt the female is impregnated and soon thereafter egg laying commences. The eggs are laid beneath the scale in rows which, as they are gradually pushed backward, lose their regularity. H. G. Hubbard, who studied orange insects in Florida, tells us that one female lays on an average about 45 eggs.

Male.—After casting the first and only skin the insect passes a pupa stage and then emerges as a perfect insect with two wings, six legs and four eyes, two of which replace the mouth for which it has no use. This stage of perfection is attained usually about the time a female, born about the same time, has cast the second skin.

The number of broods produced in course of a year has not been definitely ascertained in these islands, but it can be safely assumed to be somewhere between three and four. It will be readily observed that one pair, unhindered by natural checks, will produce within one year of four broods, 594,436 individuals. It is not surprising that, unassisted, trees are frequently reduced to helplessness and death in course of three or four years.

It is also evident that to start a colony a female must be transported during the short period of her active life, her life as a larva. The male, even tho winged, is a feeble flyer, hence is also largely dependent upon the transportation agencies utilized by the female. This is accomplished by the larva itself in case of contiguous trees. To greater distances the larvae are carried either by wind, birds, or other insects. As a bird or insect rests upon an infested tree while the larvae are crawling about in

search of a place for attachment, these crawl upon the bird's legs and the insect body, and by them carried great distances. Sometime, and when they stop to rest again, the larvae or some of them crawl off and if the food plant is favorable increase there and thus a new colony is started. Man, however, is the most significant transporting agent, especially when great distances are considered. Wherever he went he carried his domesticated plants with him and upon them he also unwittingly carried the agents of destruction of those plants. So regular and certain was he to carry the purple scale upon citrus trees from country to country that now the origin of the insect is unknown because its distribution is universal wherever citrus plants are grown.

Enemies.—There are several enemies of the purple scale in the Territory, but their combined effort seems at times to avail us little in checking the pest. As descriptions of these will follow later we will here only name them. Two ladybirds, the orange and steel-blue, are always to be found, tho but sparingly, on trees infested with this scale. They doubtless devour a good many scales, but they also feed upon other scale insects on these trees, and being few in number, their work is not telling. The same may be said of the internal parasites that manifest their work upon male and immature female scales by the round holes of their exit through the scale after devouring the insect beneath it. These parasites also attack other scale insects, hence, not being specific enemies of the purple scale their work is seldom effective. This spring most of the trees examined, especially the limbs and trunks look remarkably free of scale. Possibly the rains of the past season have depleted their numbers and possibly also the parasite have, temporarily at least, gained the upper hand.

Remedies.—A simple, inexpensive and effective remedy against this pest is the application of a soap (common or whale oil) solution (soap, 1 lb. in water, 4 galls.) applied with an efficient spray pump, while the solution is hot, three or four times in succession at intervals of two weeks. While it is doubtful whether this wash affects the full grown scale owing to its water-proof armor (this group is known as "armored scales") it is sure to kill every young larva it covers, and repeated, should kill all young that may hatch subsequently. That the application must be thoro goes without saying. Every larva possible must be killed or the work is correspondingly nullified in proportion to the number of larvae left alive.

(*To be continued.*)

REPORTS OF HORTICULTURAL QUARANTINE INSPECTION WORK.

Honolulu, Hawaii, April 3, 1907.

To the Honorable Board of
Agriculture and Forestry,
Honolulu, T. H.

Gentlemen: During the months of January, February and March we inspected thirty-five steam and sailing vessels from the mainland, seventeen from the Orient, ten from Australia and eight from other points, in all seventy-one vessels that arrived from outside the Territory, on which we found twenty-four thousand nine hundred sixty-five (24,965) packages of fruits and vegetables, twenty (20) bales, boxes and cases of plants and trees, and one hundred and fifty-nine (159) packages of seeds and plants by mail. Of the above, twenty-two (22) cases of fruit and fifty-seven (57) packages of plants and trees were infested with injurious insects and were therefore destroyed. Evidently greater care is now being exercised in the selection of fruit and plants sent to this Territory. All imports found slightly infested with insects already established here were fumigated with hydrocyanic acid gas or carbon bisulphide before delivery.

In accordance with your instructions, we have endeavored to locate all the young Indian mangoes which have been propagated from the trees that were imported and planted a few years ago, before the present inspection law was in force. The most of these trees have been located and treated and a record of them taken, so that they may be reinspected again later on.

Because of the widespread existence of "Asparagus rust" on the mainland, we now make a practice of dipping in "Bordeaux mixture" all such roots received.

A shipment of seven hundred and twenty cases of onions arrived from Australia on the S. S. Sonoma on February 20 that had been damaged by salt water. In some of the decayed bulbs we observed numbers of very small white maggots and pupae and in breeding out a few they proved to be, as I suspected, "Pomace flies" (*Drosophila*), usually found around decaying fruit, or other vegetable matter, and which are classed as scavengers.

From dead specimens of the "melon fly" (*Dacus cucurbitae*) received by this Division from the government entomologists of India, we learn of the existence of several parasites that prevent its seldom or ever becoming a pest there. An effort should be made to introduce these parasites here by way of Hongkong. This would be a difficult experiment owing to the great distance, but the undoubted benefit to the melon industry of this Territory, in case these parasites were successfully introduced and established,

would justify the expenditure of considerable money in the attempt to control this pest.

On January 22 the S. S. Mariposa was compelled to call here to secure a supply of fuel oil to finish her voyage to San Francisco from Tahiti. She had on board a quantity of young cocoanuts, also some "alligator pears," which we would not allow to be landed here, the former being subject to the attack of a fly (similar to the melon fly) in some of the South Sea Islands.

On January 11 the four-masted American iron ship E. M. Phelps arrived from Manila. We inspected the ballast on board and found it to consist of dark sand and small shells taken from the beach of Cavite below Manila. We also examined it when it was being discharged, but failed to find any trace of vegetable matter. It was used for cement work in town. Another American iron ship, the Astral, arrived from Japan on March 4 with clean sand and gravel and was allowed to discharge on the wharf. The inspection of ballast of this nature coming from foreign ports is to prevent the introduction of soil which might contain the larvae or grubs of obnoxious insects.

Fifty grafted peach trees slightly infested with the destructive "West Indian Peach Scale" (*Alaucaspis pentagona*) arrived from Japan and were immediately burned. This is the scale that was introduced into the grounds of the Department of Agriculture at Washington, D. C., and which withstood treble strength of the best liquid insecticides which only killed a very low percentage of them. From the same country came ten small Japanese maple trees badly infested with *Parlatoria theae*, also five Japanese Camellias with *Pseudaonidia duplex*. As both these pests were injurious, the plants were also destroyed.

A few orchids from the Philippine Islands were imported having a small larva working in the crowns of the plants. The plants were fumigated with hydrocyanic acid gas even to injuring the foliage, but as the larva did not seem to be affected by the fumigation each plant had to be hand picked before delivery.

Several lots of lemons imported from California were found slightly infested with "red scale" (*Chrysomphalus aurantii*), which is already here. This fruit was therefore only fumigated.

The establishment of the American-Hawaiian line of steamers between Salina Cruz and Honolulu exposes us to a new danger, i. e., the introduction of the serious orange maggot (*Trypetta ludens*). I therefore addressed a letter to the local general freight agent, C. P. Morse, calling his attention to this pest and requesting him to instruct the agents at Salina Cruz not to accept any citrus fruits as freight for any portion of this Territory, nor to allow any one to bring such fruits on any of their steamers. I also enclosed a copy of the Board's regulations and the law covering this matter.

The entomologists of this Board have recently been investigating the result of the introduction and distribution of the parasite (*Eucoila impatiens*) of the "Horn fly," which Prof. Koebele sent this Division from Arizona, and I am pleased to report that it appears to be establishing itself. This parasite has also been noticed by other entomologists, so we feel confident that it will eventually be found wherever colonies were sent during the past season, and that it will be effective in reducing the number of that annoying stock pest. This parasite will be found illustrated on page 147 of your report. This Division has commenced a systematic inspection of the neighborhoods where all of Prof. Koebele's "Horn fly" parasites were distributed, and will shortly report further as to the result of the investigation.

I beg to call your special attention to the recommendation made in my report of 1905 regarding the "Introduction of Beneficial Insects." I respectfully ask that the subject be brought before the present Legislature for action. I quote the following from the Report above referred to:

"Through the efforts of your Honorable Board, several species of internal parasites and predaceous insects for the suppression of our destructive species have been introduced, and from examination we feel hopeful that they will come up to our expectations. As Mr. Kotinsky, my assistant, has referred to this work in detail, it will not be necessary to take this matter up further than to suggest that you bring this important work before the attention of our Territorial legislators urging them to make a liberal appropriation . . . so as to enable you to further continue the search for such friendly assistants to our agriculturists. There is positively no danger from the intelligent introduction of such insects that prey upon injurious species, for their stomachs will no more digest vegetable matter than that of a lion's or tiger's will. Such insects when once introduced are constantly working without pay in the interests of our farmers, planters and, in fact, all lovers and cultivators of trees and plants, not even exacting a portion of our crop as their part. What all this means can be gleaned from the introductory remarks or statement of this report of the enormous loss by the depredations of insect pests. It is the introduced injurious species that prove to be such formidable ones, as they are usually brought into new countries without their more highly-bred, natural checks, which can generally fly away during the time occupied in the transportation of the plants. This way of fighting our insect enemies is not any longer an experimental one, but has saved millions of dollars of property, besides retaining the value of adjoining property already improved or unimproved. Not only is our farming population increased, but our merchants, tradesmen and bank-

ers also feel the effects of the improved agricultural conditions; so all our people are benefited by the expenditure of money in this work.

"We have in Prof. Koebele one of the best and most competent and successful collectors of beneficial insects in the world, so that any money appropriated for such work will be expended in the best manner, in the interest of these Islands, as his past work has fully demonstrated. As a business proposition I feel confident that our legislators will not hesitate in furnishing you with ample funds to carry out this work so successfully started."

What has been accomplished by the sugar planters in controlling the cane leaf-hopper would justify your presenting a special bill for an appropriation of at least \$5000 to carry on the work of introducing beneficial insects during the next biennial period.

Respectfully yours,

ALEXANDER CRAW,
Superintendent of Entomology and Inspector.

THE NEW LAWS.—Continued.

ACT 106.

AN ACT

TO AMEND SECTIONS 370, 371, 373 AND 375, AND TO REPEAL SECTION 372 OF THE REVISED LAWS OF HAWAII SO AS TO REORGANIZE THE BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY.

Be it Enacted by the Legislature of the Territory of Hawaii:

Section 1. Section 370 of the Revised Laws of Hawaii is hereby amended by striking out the period after the word "Senate" in line four thereof, and by inserting after said word "Senate" the following words, "one being designated as President of the Board," so that the Section as amended shall read as follows:

"Section 370. Commissioners, Appointment, Tenure. There shall be a Board of Commissioners of Agriculture and Forestry of five members, who shall be appointed by the Governor by and with the advice and consent of the Senate, one being designated as President of the Board. One of said Commissioners

shall be appointed to hold office for one year, one for two years, one for three years, one for four years, and one for five years from January 1, 1904. Upon the expiration of the respective terms of the said Commissioners, their respective successors shall be respectively appointed for a term of five years. Upon a vacancy occurring in said Board, a Commissioner shall be appointed to fill such vacancy for the remainder of the unexpired term."

Section 2. Section 371 of the Revised Laws of Hawaii is hereby amended by striking out the words "President and another" in line two thereof; and also by striking out the word "officers" in line three thereof, and inserting in lieu of said word "officers," the word "Secretary," so that the Section as amended shall read as follows:

"Section 371. Board, Officers, Quorum. The Commissioners shall elect one of their members Secretary of the Board. The Board shall have power to change its Secretary from time to time. A majority of the members of said Board shall constitute a quorum thereof, with power to transact any business within the powers or jurisdiction of the Board."

Section 3. Section 372 of the Revised Laws of Hawaii is hereby repealed.

Section 4. Section 373 of the Revised Laws of Hawaii is hereby amended by striking out the first four lines thereof, together with the word "the Superintendent of Public Works" in line five thereof, and by inserting in lieu thereof the following words "the powers and duties vested prior to April 25, 1903, in the Commissioner of Agriculture and Forestry and thereafter transferred to and vested in the Superintendent of Public Works are hereby transferred to and vested in the President of the Board," so that the Section as amended shall read as follows:

"Section 373. Executive Officer of Board. The powers and duties vested prior to April 25, 1903, in the Commissioner of Agriculture and Forestry and thereafter transferred to and vested in the Superintendent of Public Works, are hereby transferred to and vested in the President of the Board, who shall be the Executive Officer of the Board, subject to the superintendence and control of the Board."

Section 5. Section 375 of the Revised Laws of Hawaii is hereby amended by striking out the period after the word "pay" in line two thereof, and inserting after said word "pay" the words "except the President, who shall receive such salary as may be appropriated by the Legislature;" also by striking out from said section the sentence "The Superintendent of Public works shall receive no pay for services performed by him under the terms of this Chapter other than the salary appropriated by the Legislature for his said office of Superintendent of Public Works," so that the Section as amended shall read as follows:

"Section 375. Board, Expenses, Pay. The members of the Board, appointed under this Chapter, shall serve without pay, except the President, who shall receive such salary as may be appropriated by the Legislature. The Board shall be entitled to pay the traveling expenses, within the Territory, of its members when actually engaged in business relating to the work of the commission, and also all cost of postage, stationery, correspondence, records, printing and other expenses necessarily or properly incidental to the business of the Board."

Section 6. This Act shall take effect from the date of its approval.

Approved this 29th day of April, A. D. 1907.

G. R. CARTER,
Governor of the Territory of Hawaii.

ACT 94.

AN ACT

MAKING SPECIAL APPROPRIATIONS FOR THE USE OF THE COLLEGE OF AGRICULTURE AND MECHANIC ARTS OF THE TERRITORY OF HAWAII, DURING THE TWO YEARS WHICH WILL END WITH THE 30TH DAY OF JUNE, A. D. 1909.

Be it Enacted by the Legislature of the Territory of Hawaii:

Section 1. The sum of Ten Thousand (\$10,000) Dollars is hereby appropriated out of any money remaining in the Treasury for and on account of the Loan Fund, for the erection of a building or buildings for the use of the College of Agriculture and Mechanic Arts and the purchase of fixtures, apparatus, and appliances for the same.

Section 2. The sum of Fifteen Thousand (\$15,000) Dollars is hereby appropriated to be paid out of all moneys in the Treasury of the Territory received from all current receipts of the general revenue for the use of said College for the biennial period ending June 30th, 1909, as follows:

Salaries and pay roll	\$10,000
Incidental expenses	5,000

Section 3. This Act shall take effect from and after the date of its approval.

Approved this 23rd day of April, A. D. 1907.

G. R. CARTER,
Governor of the Territory of Hawaii.

BY AUTHORITY.

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY.

Notice is hereby given that MR. W. M. GIFFARD has been elected PRESIDENT of the BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY to succeed MR. L. A. THURSTON, resigned.

C. S. HOLLOWAY,

Secretary and Executive Officer,

Board of Agriculture and Forestry.

Honolulu, H. T., April 9, 1907.

Notice is hereby given that MR. A. M. NOWELL is now DISTRICT FIRE WARDEN for the whole of the District of Waialua, Island of Oahu.

C. S. HOLLOWAY,

Secretary and Executive Officer,

Board of Agriculture and Forestry.

Honolulu, T. H., April 6, 1907.

Notice is hereby given that MR. GEORGE C. WATT has been appointed DISTRICT FORESTER in and for the District of North Kohala, and that portion of the District of Hamakua lying between the District of North Kohala and the Waimanu Valley, Island of Hawaii; and DISTRICT FIRE WARDEN in and for that portion of said District of North Kohala extending along the coast from the land of Kaauhu to the Hamakua District line.

Notice is hereby given that MR. SAMUEL P. WOODS has been appointed DISTRICT FIRE WARDEN for that portion of the south part of the District of North Kohala, Island of Hawaii, extending around the coast from the north boundary to the land of Kawaihae 1, to and including the land of Kaauhu.

C. S. HOLLOWAY,

Secretary and Executive Officer,

Board of Agriculture and Forestry.

Honolulu, T. H., April 8, 1907.

RULE AND REGULATION BY THE BOARD OF COMMISSIONERS OF
AGRICULTURE AND FORESTRY CONCERNING THE
IMPORTATIONS OF RICE.

RULE III.

The Board of Commissioners of Agriculture and Forestry hereby make the following rule and regulation:

Section I. For the purpose of preventing the introduction into the Territory of Hawaii of insects, their larvae or pupae, injurious or liable to become injurious to rice either growing or stored, all persons, companies and corporations are hereby prohibited from introducing or importing into the Territory of Hawaii or into any of its ports, any rice infested with such insects.

Section II. If any rice infested with insects, their larvae or pupae, injurious to rice either growing or stored, shall be imported or introduced into the Territory of Hawaii or into any of its ports, the same shall, in the discretion of the Board of Commissioners of Agriculture and Forestry, or its duly authorized agent, officer or inspector, be immediately destroyed or deported at the expense of the importer or introducer, and the person or persons or corporation introducing or importing the same shall be guilty of a misdemeanor and shall be liable to the penalty or penalties provided by law.

Section III. This regulation shall take effect from and after the approval thereof by the Governor.

C. S. HOLLOWAY,

Secretary and Executive Officer.

Approved:

G. R. CARTER,

Governor of Hawaii.

Honolulu, September 7th, 1906.

The publication of this regulation in the "Forester" was inadvertently overlooked.

NEW WORK ON HAWAIIAN FRUIT.

Fruits of the Hawaiian Islands, by Gerrit Parmile Wilder, in three volumes, Volume I, Illustrated with thirty-six Half-Tone Plates, Honolulu, 1907, Hawaiian Gazette Co., Ltd.

The first volume of Mr. Gerrit P. Wilder's work on the fruits of our islands, has recently been published, and in its merits quite fulfills the expectation with which it was anticipated. It consists of a series of half-tone reproductions of Hawaiian fruit, each of which is accompanied by an interesting description. Botanical, historical and cultural notes are freely given and add greatly to the value of the volume to the general reader, who often is deterred from the enjoyment of books of a similar nature from a multiplicity of technical terms. Here, however, scientific nomenclature is not obtrusive and one unversed in botanical lore, can find both recreation and enjoyment.

Mr. Gerrit P. Wilder has long held a reputation for the work upon which he is engaged of introducing and developing new and better varieties of fruit. In the past he has achieved great success in the grafting and budding of avocado pear and mango trees. He is also actively engaged in evolving types of such fruits as papaias and mangoes better suited to the peculiar requirements necessitated by supplying a market two thousand miles distant from the source of supply. This is a work requiring some years for a satisfactory result, but upon which encouraging headway has been made.

To many who have not investigated the subject, the wide diversity of the fruit grown in the islands as shown in the first volume of Mr. Wilder's book, is as astonishing as it is pleasing. The species illustrated and described include such well known ones as the avocado pear, the papaia, and the fig, and such rare specimens as the durian, the sapodilla and the sapota. Those who have been wont to associate the delicious Poha with everything Hawaiian, will be surprised to learn its Brazilian origin, and its association with the prosaic "Cape Gooseberry." So long a sojourn in our midst has given the Poha a familiar air and allowed it to masquerade as a member of our native flora.

The information regarding the fruit of the male and female papaia trees will be interesting to many, and also that concerning the durian, which possesses the unique distinction of conjoining the most repulsive and nauseating odor with the most fascinating and luscious flavor. This tree, a native of Java, is considered by some authorities to produce by far the most delicious fruit in the world. Its flavor is said to resemble a mixture of sherry, cream, ripe pineapple and onion, and is so highly regarded that travelers make journeys even from Europe to enjoy it.

The student will find much in Mr. Wilder's book to repay its perusal. We commend it to all who are interested in the study of our island fruits and we look forward to the publication of future volumes.



Mountain Apple.

One-third natural size.

—From Gerrit Parmile Wilder's book, "Fruits of the Hawaiian Islands," Plate viii.

NOTES ON SOME DISEASES OF THE PINEAPPLE.

By N. A. COBB.

From an examination of three pineapple areas in widely different parts of the world I should say that the probable course of events to be expected in the growth of such an agricultural industry would be as follows:

First, the introduction of fairly good seed pines on fairly good land suitable to the industry.

Second, a period of rapid growth during which the profits are satisfactory.

Third, a period of falling off in the yields, due to the accumulation of the pests of the crop.

Fourth, a period of loss, followed by the closing of many of the concerns engaged in the industry, a period of keen disappointment to many having money invested in the industry.

Fifth, a period of adjustment, during which the profits are small to nearly all concerned, until such methods of growth are reached as can be permanently followed with paying results.

I do not believe that the main features of this program can be altered. I base this belief on the fact that there is no known way of preventing the accumulation of the pests of the crop. To a large extent it is possible to repair the depletion of the soil due to the growth of the crops, and at a cost that still leaves a good margin of profit. It is known that to a certain extent the fall in yield, where pineapples follow pineapples for a series of years, is due to what is commonly termed exhaustion of the soil. It is my belief that this loss is much less serious than that due to the accumulation of disease. The diseases arrive in ways that are beyond our knowledge in some cases, and beyond our observation in nearly all cases, and hence are to a great extent beyond our control. We can delay their arrival, and we can hinder their development after they do arrive, at least in the case of those whose nature we understand, but that is all we can expect to do.

This may seem a rather gloomy picture, but I have put in the darks first for several reasons. I have seen something of

the disappointment that follows from not appreciating the facts as above presented. A broken industry and a disappointed people are not pleasant sights, and one does not soon forget the impression they create. Their greatest use is to teach others to profit by studying into the cause of the misfortune.

It seems to me that the principal cause of failure in the pineapple industry is contained in the third stage sketched above, namely, in the period of failing off in the yields due to the accumulation of the pests of the crop.

Now, while it is not possible by any known practicable means to prevent the arrival of these pests, or to prevent their accumulation, it is possible to delay their arrival, and to hinder their development to such an extent that the period of acute depression in the business, which has been a very constant feature of the history of such enterprises, can be both delayed and mitigated so that the industry does not have to suffer a readjustment following on bankruptcy and all its attendant disappointments and evils. All that is necessary to do this is to provide beforehand for these necessary evils.

The main line of action is to watch for the arrival of possible pests with a view to stopping them altogether. Nothing less should be the aim of all inspection and quarantine of imports. This part of the plan is in operation in Hawaii in the form of an inspection of imports. The effect of this beneficent law should be to at least delay the arrival of pests. It is unreasonable to expect the impossible. In spite of all precautions, we know that diseases do occasionally get past almost any inspection. After they arrive at the pineapple plantations they may be hindered in their accumulation, and the exercise of sufficient care will prevent their ever becoming the scourge they may become if they are neglected.

The following pages deal with one of the main rots of the pineapple that has already arrived at the plantations on the islands of Oahu and Kauai, and in all probability the remaining islands where the pineapple is grown. At the present time this rot is not causing such severe losses as it will undoubtedly cause in the near future, unless greater precautions are taken to prevent its accumulation. I refer to the fungus scientifically known as *Thielaviopsis ethaceticus*, Went. At present this is the commonest rot of the pineapple in Hawaii. Nearly every pineapple grower will at once recognise it when I say that it is the soft rot accompanied by a sooty black color of the watery tissues in the last stages. The earlier stages are not accompanied by the black color; on the contrary, the fungus merely softens the tissues, discoloring them but little.

I have described this disease as it relates to cane in a bulletin published by the Hawaiian Sugar Planters' Association. The following is quoted from that source. After reading it the reader will see that this rot is one of equal interest to both industries.

THE PINEAPPLE DISEASE.

(*Thielaviopsis ethaceticus*, Went.)

"The disease was first studied by Dr. F. Went, in Java. He first investigated and classified the fungus causing the disease. Since that time (1893) it has been observed in the West Indies and in Hawaii.

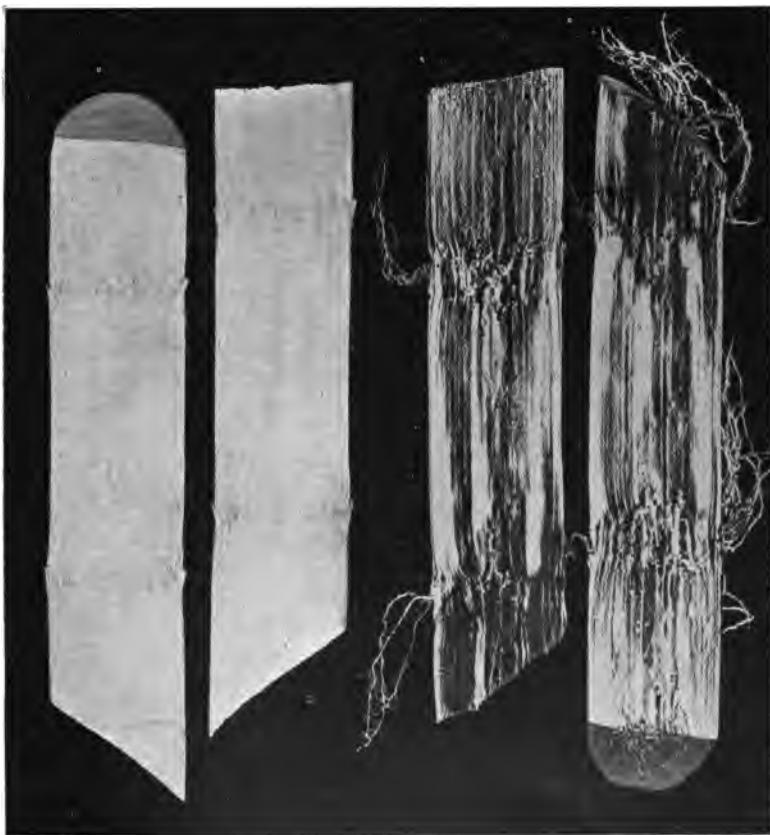


Fig. 1. Two cuttings to show more clearly the destructive action of the pineapple fungus. The right hand untreated cutting has been completely ruined in a few days although its condition when planted was like that of the sample shown at the left.

It is commonly asserted that this disease of the sugar-cane receives its common name on account of the fact that its presence in the tissues of the cane gives rise to an odor resembling that of pineapple. The specific name of the fungus, *ethaceticus*, refers to the same fact, its translation into English reading, "acetic ether," so that we may call the species the acetic-ether-producing fungus.

It is true, that, in some of its stages, and especially in some varieties of cane, the growth of the fungus gives rise to an odor reminiscent of ripe pineapple, but a delicate nostril would seldom, I think, mistake one odor for the other. More often the odor is that which we associate with fermenting fruit juice, due no doubt to a mixture of the vapors of various alcohols, acids, and ethers, prominent among which may be, and probably is, acetic ether. This odor of fermentation is the usual characteristic of most of the stages of the pineapple fungus as it occurs in cane. Only the later stages of the fungus attack are devoid of this odor, or if present, it is overpowered by others.

There is another reason why the name pineapple disease may be applied to this malady of cane, and that is that the same disease attacks the pineapple, as well as some other fruits. This fungus is, in fact, one of the serious diseases of the pineapple in some places. It is prevalent in the Hawaiian Islands on pineapples and does no small damage on some plantations.

The fact that the disease can be present in a most pronounced form without the odor of pineapple being noticeable renders the name a little unfortunate from the first point of view, but nothing can be said against the name from the second point of view, that is to say in view of the fact that the disease also attacks the pineapple. It is well to know that in fields where the disease is common one may often dig up and examine scores of cuttings without once detecting a pronounced odor of pineapple. As before stated, the variety of cane is one factor in the production of this odor. Yellow Caledonia is one of the varieties that even when suffering acutely usually gives off merely an odor of fermentation. I have found the ethereal odor most pronounced in such varieties as the Striped Singapore, and in such canes the odor is sometimes much stronger than that of the most highly scented pineapple.

HOW TO DETECT PINEAPPLE DISEASE.

To detect this disease in planted cuttings one has therefore to rely upon other indications than the odor of the diseased tissues. The odor is usually present in a faint degree, and is certainly quite different from that of sour cane. As a rule it is a very faintly ethereal odor that almost evades detection and is rather earthy and clean in character.

The visual characters of the disease are subject to considerable variation, but there is one character that is more or less decisive, and that is the occurrence of a "pipe" through the axis of the cane. This pipe is dark colored, in fact, is sooty black when fully developed. I know of no other cause for this peculiar appearance when it occurs in planted cane cuttings. The rind-disease will discolor the interior of cuttings, and even render their tissues more or less black. But these dark appearances are marginal rather than central, and are seldom symmetrically arranged. Nor are they, as a rule, sooty in appearance. We may assume then that any cutting that has been planted for above a week and shows a central sooty-black "pipe," is suffering from pineapple disease, especially if the odor of the more undeveloped part of the pipe is of the character described above; and if the odor is distinctly that of pineapples, or thereabouts, there can be no doubt of the identity of the disease. This makes it unnecessary in many cases to resort to the microscope for a determination.

The onset of the disease is at the end of the cutting, and it proceeds toward the middle along the axis of the cutting, usually from both ends. It appears that the looser axial portion of the cane stalk is that most suitable for the development of the fungus, no doubt on account of the presence of air. Finally, of course, all parts of the cutting except the rind are attacked. The softer varieties like Lahaina, Rose Bamboo and Striped Singapore are reduced to a mass of black fibres contained in a thin shell, for the rind resists decay much longer than the center. If the variety has a thick and tough rind the "pipe" is more pronounced and is confined more nearly to the axial region. This is true of Yellow Caledonia.

The disease is not known to have the power to enter the sound tissues of cane or other plants. As it always enters through some break or wound, it is ranked with the wound parasites. So far as cane is concerned the "wound," in most cases, is the cut surface of the cane, the disease being largely confined to attacks on cuttings after they are planted.

PROGRESS OF THE DISEASE.

In its progress through the cutting the fungus has to pause at each node on account of the extra density of the nodal tissues. After struggling through the node it again makes rapid progress until it reaches the next node. The entrance to a new internode is usually marked by the appearance of pink or red elongated streaks in the central tissues of the cutting, and these colors may extend in a modified degree to the marginal parts. It is during the accelera-

tion of the disease due to its entrance into a new internode that the odor reaches its maximum. In the softer varieties of cane the odor at this stage is strong and almost penetrating.

MICROSCOPIC TEST.

The most decisive test of all, of course, is the microscopic examination,—in fact, in some cases it is the only certain criterion. If the spores of the fungus can be obtained, the identity of the disease is at once put beyond question.

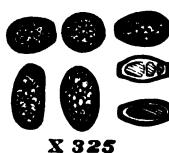


Fig. 2. Macrospores of the Pineapple Disease *Thei l a v i o p s i s ethaceticus*. It is these spores which impart to the tissues attacked by Pineapple Disease the characteristic dark color. These spores do not germinate at once but require a period of rest.

The sooty black appearance of the central tissues is brought about by the formation of dark-colored spores on the ends of certain mycelial branches. These spores appear only after a certain length of time, and it is therefore desirable to be able to recognize the fungus in its mycelial stage. This is not difficult. There are a number of fungi that attack cane cuttings, but of all these the mycelium of the pineapple fungus alone has certain fairly well defined characteristics.

The microscopic test is conducted as follows: Search for tissue that appears to have been darkened by the disease, and from such tissue scrape away some of the loose dark portion with a clean tool and mount it in clean water and search with a moderately high power of the microscope for the characteristic spores of the fungus.

If the tissues are only recently invaded, it may be that no darkening has yet taken place. In that case the darkening may be quickly induced by giving the tissues access to air. If a cane cutting in the early stages of the disease, while its tissues are still only in the red stage, be split open and put back together and laid in a still place, such as a drawer, in the course of twelve hours its tissues will often assume the dark appearance due to the formation of the macrospores of the fungus. These spores may then be examined and the diagnosis thus completed several days earlier than would otherwise have been possible.



Fig. 3. Microspores of the Pineapple Disease *Thei l a v i o p s i s ethaceticus*. These spores are smaller than the macrospores and more transparent. They are also produced in a different manner, as shown in Fig. 4, arising inside the mycelium and being pushed forth from the broken end of mycelial cells. These spores germinate at once and serve to keep the disease in active propagation. Their existence is a transient one.

The structure of the fungus is such that apart from the formation of the spores it may be provisionally identified from the mycelium. This arises in most cases from the germination of the microspores or the macrospores. It is not often, in all probability, that the disease is transferred from one host to another by means of the mycelium.

The microscopic appearances of the various parts of this fungus are well shown in Fig. 4. The mycelium, at first colorless, becomes at last light to dark brown, though never of the latter color except in the fully decomposed tissues of the heart of the cane. In the partly discolored and the reddish tissues associated with the onset of the disease the mycelium is nearly always colorless. The mycelial cells are from three to ten or more times as long as broad, and contain refractive bodies, more particularly in the neighborhood of the spore-bearing branches. It varies in thickness from three to eight micromillimetres, and is extensively branched, the longer branches naturally lying in the same direction as the axis of the cane.

APPEARANCE OF THE SPORES.

The thin-walled microconidia, which germinate so easily and hence serve to spread the disease rapidly, are formed in

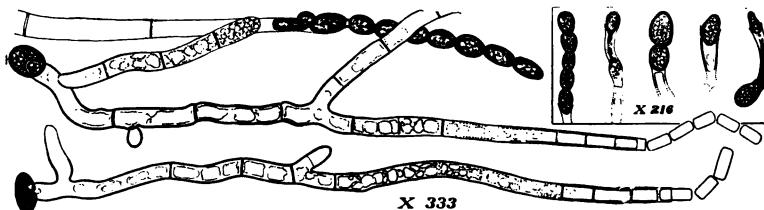


Fig. 4. Mycelium of the fungus causing Pineapple Disease, *Thielaviopsis ethaceticus*. This mycelium is abundant in the pinkish, reddish, brownish and black tissues of cane attacked by this disease. It is a well characterized mycelium and it is possible to identify it with some degree of certainty, especially by means of the following test: If the fresh tissues containing the mycelium be cut open and exposed over night to the air in a moist situation, the mycelium rapidly produces the dark colored macrospores characteristic of this fungus.

The larger figures are taken from a hanging drop culture, while the figures in the rectangle in the upper right hand corner are taken from specimens found among cane tissues. Two spores are shown to have germinated in the hanging drop culture and to have begun the production of chains of microspores as described in the text. Above may be seen a chain of the darker colored microspores mentioned in the text.

The five figures in the small rectangle may be described in order thus, beginning at the left: First, a chain of the elliptical darker colored microspores; second, a macrospore proliferating; third, regular formation of macrospores; fourth, single microspore in process of formation from inside a small branch of the mycelium; fifth, spore germinating and producing a single microspore.

the cells of special nearly colorless branches of the mycelium about one hundred micromillimetres long and of varying diameter according to the part measured, being widest considerably behind the middle (8—10 micromillimetres) and from

thence tapering to the open end from which the microspores are escaping. These are cylindrical, nearly colorless, measure about five micromillimetres in diameter by ten to fourteen micromillimetres long, and occur in or outside the cells of the mother mycelium in numbers up to twenty, but generally less than half this number. These spores are sometimes seen to be of smaller size, ellipsoidal form, with a thicker wall and darker color. These dwarf spores are, however, produced row-wise inside the cells of the mycelium, and all possible intermediate stages connect them with the regular microspores.

The dark-colored macrospores, which in the later stages of the attack impart to the diseased tissues their dark color, are borne in an entirely different manner and have an entirely different function. They are far larger than the microspores, measuring $10-12 \times 16-19$ micromillimetres, and are more or less ellipsoidal in form. The brownish to blackish wall is thick and impervious. The ends often indicate the position of the previous attachments, so that the contour is not exactly ovate or ellipsoidal. Though these conidia are usually borne in chains at the ends of special branches it is not infrequent to find them borne singly. This is usually brought about, I think, by the falling away of all the members of the chain except the proximal one.

The microconidia germinate promptly and easily, merely in the presence of moisture. The macrospores germinate with much greater difficulty, and only after a period of rest.

From this quotation the reader may acquire a very fair idea of the fungus as it occurs in cane. The characteristic pipe mentioned in connection with the stalk of the cane plant is never seen, of course, in the pineapple. Moreover, the rot presents certain peculiarities in the pineapple that call for special mention. These points will now be taken up and discussed in order.

THIELAVIOPSIS IN PINEAPPLE.

Taking sections of one of the carpels at a point a few millimeters from the surface of a pineapple that has only just begun to show traces of the sooty blackness due to the formation of the black macrospores, and at a distance of two to four inches from the dark macrospore formation, one may see that the already watery tissue is mainly composed of the mycelium of the *Thielaviopsis*. The mycelium is easily distinguished, as it is darker in color than the other tissues and than most mycelium. In this colorless part one may see that the formation of the microspores precedes that of the macrospores.

The microspores arise in the mycelium of lesser diameter, and appear to form first in the vicinity of the vascular tissue of the pineapple. The rather dark mycelium, which owes its color partly to the refractive nature of its numerous granules, gives rise to colorless elongated non-granular microspores, each generally with a single excentric refractive body.

A remarkable growth of the microconidia was produced by the following procedure. A pineapple so far rotted that the macrospores had appeared for about an inch at the base of the core was halved by an axial longitudinal cut. An examination of the tissues showed that the mycelium was present in great quantities even near the surface of the rind almost to the very tip of the fruit. The tissues were watery and the juice of the fruit was exuding on to the surface on which the pineapple lay. The fruit was so soft it had to be handled carefully in making the section to avoid breakage.

After eighteen hours a frosty-looking growth had appeared on the cut surface of the pineapple, which had meanwhile lain exposed to the air. The first thought was that the growth was immature penicillium, but a casual glance threw doubt on this supposition. Then, for an instant, I wondered whether crystallisable salts in the fruit had possibly crystallised and formed a surface incrustation as a result of evaporation. These random thoughts are mentioned merely to illustrate the appearance of the growth. An examination showed that this growth was purely microconidial and *aerial*. The chains of spores were either isolated or grouped in contact, and the depth of the growth was fully one millimeter at its deepest part. The appearance under a two-thirds objective was that of a deposit of hoar frost. At the base of this growth of microconidia, and in the wet tissues of the pineapple, the macroconidia were in process of formation, and many were already fully formed, so that the tissues acquired a dark color.

The appearance of the chains of microconidia was not that ordinarily seen when these are produced in the tissues of the fruit. Under such circumstances the conidia are to be seen forming in the mycelium of the fungus, and after they are complete they are pushed forth from the ruptured ends of the cylindrical mycelium. The walls of the spores can be seen to be entirely separate from that of the mycelium. In the case of these aerial microconidia, however, the appearance was entirely different. The conidia were in moniliform chains of the most beautiful regularity, the spores remaining joined at the central part of the area between them, so that the appearance was that familiar in the case of the aerial conidia of *Sphaerotheca pannosa* and other Erysiphaceae. Outside these

chains of spores no mycelial wall was to be seen. In fact, it appeared that the spores had formed merely by the segmentation of aerial mycelium, which, however, originated internally from other mycelium. For these spores the name aerial conidia is at once descriptive and noncommittal. It is evident to me from my studies of this fungus that its various forms and activities are as yet but imperfectly understood.

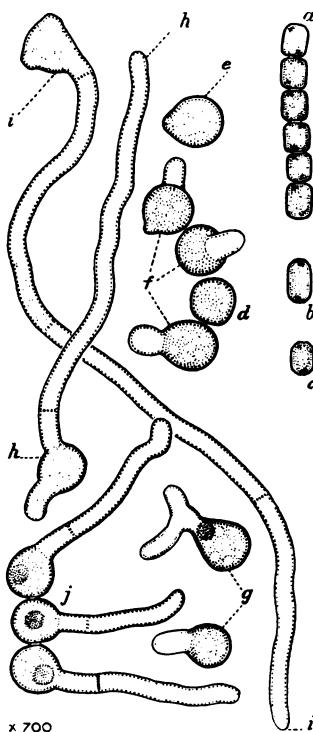
The further history of the aerial conidia is as follows: In the course of twenty-four hours the white coloration due to the mass of these spores becomes darker owing to the slight darkening of the spores themselves, but more particularly to the growth of ordinary macrospores from the mycelium below. The chains of aerial conidia placed in water no longer remain intact. They break up almost without exception. The spores

have the dimensions shown in the adjacent table. If they are placed in proper nutritive fluids they germinate promptly. The first indications of germination is a change in the form of the spore, by which it becomes nearly spherical. It then germinates from what was the side or the end of the spore, apparently more often the side. It is often difficult to say what part of the spore produced the hypha, so perfectly round do they become before germination. In the course of 12-15 hours the mycelium, which is colorless and more or less regular in form and direction up to this stage, may be 25 times as long as the swollen spore is wide. The mycelium is septate, the cells being 5-15 times as long as wide, and each hypha containing several such cells. Up to this stage the hyphae are little, if any, branched. The present description is made from the germination of spores that had passed through the intestinal canal of *Eristalis punctulatus*, Macq., the commonest Syrphid fly around Honolulu, but there is no reason to suppose that the germination of spores that had passed through this insect would present any peculiarities worth mention.

THIELAVIOPSIS AND FLIES.

If some of the sooty black mass be taken from a pineapple and be forced gently through the meshes of the finest miller's silk sieve, that is, a sieve of about 100 microns square (1-250 inch) in the clear, the macrospores may be separated out in considerable purity. By accumulating these spores in a watch glass of water, and assembling them with the aid of sedimentation and rotation, it is very easy to procure them in such numbers

that every small drop of 10 miligrams weight will contain thousands. Using such a concentrated spore sediment as a solvent for grains of sugar it is not difficult to prepare a fly-food such that if the spores survive fly digestion it is easy to test their subsequent germination. As a matter of fact, some flies exercise a considerable choice in the size of the solid particles that they ingest. They are supplied with a sifting apparatus by the aid of which they can exclude particles exceeding certain dimensions. It appears, however, that the



x 700

Fig. 5. Explanation of the figures of aerial conidia of *Thielaviopsis*.

Eleven spores germinating, and eight that have not yet started to germinate. *a*, a chain of six aerial conidia as they occur when attached to the parent mycelium. *b*, *c*, two spores showing some of the extremes of size and form; *d*, a spore that has swollen and become somewhat spherical preparatory to germination; *e*, a spore that has become spherical and started to send forth mycelium at the left hand side; *f*, three spores a stage farther advanced than that at *e*, these three spores being part of the same chain as that marked *d*, but all now separated; *g*, two spores still farther advanced than those at *f*, one of them having started to branch at a much earlier stage than is usual with this species; *h*, *h*, spore whose hypha has one septum; *i*, *i*, spore whose hypha has two septa; *j*, three spores still attached to each other that have nevertheless germinated.

The spores *a*, *b*, *c*, have been mounted in water and drawn at once. The remaining spores have been passed through the fly *Eristalis punctulatus*, a common Syrphid fly, and afterward germinated in pineapple juice. The passage through the fly makes no difference in the germination of the spores. The spores *a* to *c* would, if placed in pineapple juice, germinate in precisely the same manner.

macrospore of *Thielaviopsis* is somewhat below these dimensions. At any rate, the spores are ingested by various common species of flies belonging to the Muscidae, Sarcophagidae and Syrphidae. All the species I have tried are such as normally search out and prefer saccharine food. These take in the *Thielaviopsis* spores with sugar solutions artificially prepared as described, and the spores pass through the insects with little if any apparent alteration. From one to a dozen or more spores are to be found in each portion of excrement



Fig. 6. Diseased pineapple about one-third natural size. *a*, *a*, angle at the base of the fruit where the disease found an entrance owing to the presence of insect wounds; the dark portion shows the nature of the advance of the rot upward through the fruit. The dark color is due to the formation of the black macrospores of the rot-fungus, the mycelium of the fungus being really considerably in advance of the dark coloration; *b*, apex of the visibly rotten part. It will be noted that the fungus advances most rapidly along the fibrous part of the fruit.

passed. Some of these spores are broken, but no greater proportion than before ingestion. The breakage is due to the treatment with the sieve. Even the microspores appear in the excrement apparently unaltered. In the same manner the aerial conidia of this fungus collected in water slightly sweetened may be fed to flies with the result that they pass through the alimentary canal unaltered.

All these spores germinate readily after passing through the canal of the flies. It appears to make little difference what fly is used so long as it is a species that is accustomed to seek saccharine fluids as food, or is omnivorous and accustomed to saccharine food. In all such cases the spores, if passed through the fly in what seems to be the normal way, will germinate afterwards. If the fly has a good supply of food, in other words, all that is desired, the passage of the food through the most common species requires only a short time. The principle of the fly's digestive economy seems to be the use of large quantities of food and the absorption of only what is readily soluble. Thus, in the case of spores placed in sweetened water, only the saccharine matter is absorbed. The spores, even when they are rather frail and thin-walled, suffer little if any diminution in vitality by passage through the fly. *The consequences of the general statement thus made are almost beyond conception. The relations of flies, not only to the pineapple disease, but to diseases of all sorts, is thus shown to be of the very greatest importance.*

The location of the pineapple rot is largely determined by insects, and its spread from one plant to another is largely the result of insect work. The mealy bug, as it is called, of the pineapple naturally seeks protected places where it can find food of the right nature. The protected places are the lower angles between the carpels on the lower part of the fruit and beneath the lower leaves of the top. At these points it seeks out the tender places where it can insert its proboscis for the purpose of sucking up its food. As the fruit grows there is a gradual opening out of the angle between the carpels by which new epidermis not hitherto exposed comes to the light and air. It is through this tender epidermis that the insect prefers to insert its proboscis. At the apex of the fruit, just below the lower leaves of the top, is another location where the insect finds similar congenial conditions. The location of the insect determines to a considerable extent the cracking of the fruit, and it is through the cracks following on the results of the insects' punctures that the rot finds an entrance. Hence the rot is most common at the base of the fruit and at the top. Occasionally the blossom end of a carpel will be suffi-

ciently open to allow the entrance of one of the young insects, so that we find the blossom cavities not infrequently inhabited by the insect. But this is not so common nor so injurious a feature as those just mentioned.



Fig. 7. Slice of pineapple from a tin that had "gone bad." It will be noted that there are dark stains to the number of about ten. These stains correspond in position with the bundles of fibres that pass to the different carpels of the fruit. This again shows the tendency of the rot to pass most rapidly through the most fibrous tissue. It is not certain that this slice was affected with the *Thielaviopsis* fungus.

From these facts we may draw most important inferences as to the treatment necessary in order to prevent the attacks of the rot. The problem involves entomological as well as fungus factors, as is not infrequently the case when we come to study the full life history of a fungus.

First let us deal with the entomological part of the problem, as that is more easy of comprehension, in that it deals with an organism apparent to the unaided eye. If one looks attentively at a pineapple, and especially if he takes the trouble to probe a little with a pocket knife and to look about with a pocket lense, he will easily confirm what has been said as to the habitat of the mealy-bug of the pineapple. It is most abundant at the base and at the top of the fruit. At the top it is the habit of the insect to push its way into the axils of the leaves, and as one removes leaf after leaf at the base of one of the

tops he will be surprised at the narrowness of the crevice into which one of the flat young larvae of the insect can crawl. It is perhaps for this very purpose that the young insect is so very flat.

Observe how important a factor this is in the life history of the insect. All the young insects that have the instinct to force their way in among these top leaves stand a good chance to be transplanted along with the top. When the top is planted in a new field it takes root, and as it grows it gives rise to new parts that accommodate the insects, so that these latter propagate to advantage. It is for this reason that the bulk of the insects are to be found at the base of the fruit. A few of them, however, wander to the top, and it is these that help carry the blight over to the next crop of pineapples.

The precaution suggested by these facts will by this time have become patent to any reader. When the tops are removed for the purpose of planting out, the greatest care should be exercised to see that none of the scale insects are transplanted

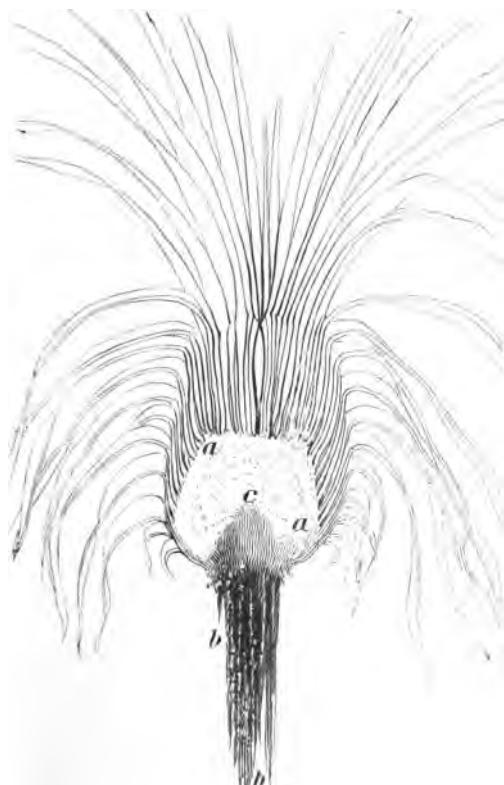


Fig. 8. Top pulled from a rotten pineapple to show that the tissues of the top are subject to the attacks of the *Thielaviopsis* fungus. *a*, *a'*, sound tissue of the top; *b*, black fibers pulled from the rotten part of the pineapple and carrying multitudes of spores, so many that the fibers are black with them; *c*, point to which the discoloration due to the rot extends; the fungus mycelium, that is the disease, will be found some distance in advance of this point. It is to be hoped that such a top as this would rarely be planted, even after the most severe trimming. The point to be specially noted is that the *tissues of the top are subject to the disease*. Here we have them attacked. If they are subject to the diseases, they are liable to contract it after being planted, if the soil happens to contain the spores of the fungus.

at the same time. Remove as many leaves at the base of the cut-off top as may be necessary to secure this end. It is better to waste the top than to run the risk of planting out the blight. Any practical person can satisfy himself of the utility of this precaution wherever the insects are abundant if he will take the few minutes' trouble necessary to make the pocket lens examinations described.

Now the ultimate result of this precaution is the prevention of a large amount of rot. The damage the insects do is not so very apparent to the ordinary observer. I think most of the growers with whom I have conversed have shown a comparative disregard for this insect. The losses from it appear to them to be slight. Occasionally a pineapple looks bad with the blight caused by this insect, but the number is not so great as to cause much anxiety. However, when the fruit is shipped, and rots on the way to market, questions begin to arise. Now, the answers to these questions lead back, as we have seen, to this insect. The rot is caused by a fungus, possibly by more than one fungus. But it is the insect that brings the pineapple into the condition that gives the fungus its best chance. No doubt the fungus would in any case ultimately find its way into the pineapple; still, the insect helps it to find a way in much quicker than would otherwise be the case.

Another point to be attended to by the provident planter is the complete destruction of pineapple refuse. All such refuse contains the material necessary to start the disease afresh in new fields, and it is truly wonderful the number of ways in which this may occur. Spores are minute things,—too small to be seen by the unaided eye. Their abundance is enormous. It is indeed difficult to overstate their abundance. Almost any moving object will be found more or less likely to carry them from place to place. They become detached from their place of origin and are washed away by water, or lifted by the wind, whirled aloft and it may be scattered for miles around. Failing this they may be carried by moving animals, including insects and man. The ubiquitous fly carries all sorts of minute objects of this kind on its feet. There is a small beetle that is almost invariably found in rotting pineapples. This beetle daubs itself with spores and in passing from one fruit to another it carries the spores of the fungus, causing the pineapple rot. This chain of thought might be carried out to an almost indefinite extent. But enough has been said to indicate its importance.

The "mealy-bugs" are attended by ants. I am not aware of the precise relations between the ants and this particular species, but

it is known that in some cases the ants take the trouble to carry aphides from place to place in order that the aphides may thrive. Thus when the pasturage for the aphides becomes poor, the ants remove them to better feeding-grounds.

Whether these mealy bugs wander from the base of the pineapple to the top in order to establish new colonies I do not know. It is possible that they may be carried from the base to the top by ants. Such a thing would be no more wonderful than many of the things ants are known to do in this connection.

At any rate, it is certain that the mealy bugs in some way find their way from the base of the pineapple to the tip.

PINEAPPLE ROT.

(That is *Thielaviopsis ethaceticus*, Went.)

Pineapples carried off by *Thielaviopsis* often rot from the top. In this case the fungus makes its way down into the pineapple by way of the fibers of the core, as may be easily seen when the characteristic black color develops. The same or similar phenomena occur when the rot makes its way in at the side of the fruit, as it less frequently does. The reason the rot enters at the bottom or the top has already been indicated. It is because the insect attacks, apparently necessary as a preliminary, occur principally at the bottom and the top of the fruit.

In its final stages, a fruit that has rotted from above will permit of the easy removal of the top. It pulls away easily and the black fibers of the core of the fruit come away like a sort of root system. This is shown in Fig. 8, which illustrates, in an exaggerated way, what may take place in using tops for new plantations. In the case illustrated there would be no question in the mind of anyone that some of the rot is taken away with the removed top. It can be seen. Now, if in such a case the lower part of the axis of the top be examined it will be seen that the rot ceases a little way into the top. The black color of the rot can be seen in the hard tissues of the center of the top. The fungus actually extends some distance beyond the black coloration. This is an important matter to understand, because it shows how a planted top may contract the disease. It may even be that through carelessness such a top with rotten tissue at the bottom is planted. The more important thing to note, however, is that this observation proves that the *axis of the top can contract the disease*. The tissues of this part of the pine-

apple are such that they afford a suitable food for the fungus to grow in. Not perhaps the best of food, but, at any rate, such that the fungus can live. Now, if that is the case, it is evident that any top planted out in an infested field stands a chance of contracting the disease. In just such proportion as its tissues are suitable food for the fungus, in that proportion it will be liable to become diseased if it is exposed to the fungus. *This shows how important it is to keep the soil of the pineapple plantation as free as possible from this fungus.*

It will be noted that the fungus does not penetrate beyond a certain distance into the top. From this it is evident that at a certain point the tissues become less suitable to the fungus than they are lower down. From this we may correctly argue that, when planting, the removal of the tissues from the lower part of the pineapple top is a wise precaution, as the lowermost tissues of the new plant will then for some time offer some resistance to the attacks of the fungus should it be present in the soil.

THIELAVIOPSIS AND BORDEAUX MIXTURE.

Experiment has shown that cane cuttings can be protected from the bad effects of pineapple fungus, that is *Thielaviopsis*, for weeks, or, it may be, months, in some cases, by the application to their ends of fungicides such as Bordeaux mixture or tar. The facts of the case are presented in Bulletin No. 5 of the Hawaiian Sugar Planters' Association, Division of Pathology and Physiology, to which the reader is referred.

Field inoculation showed the power of the *Thielaviopsis* of the pineapple to infect cane cuttings, so that there is no probability that the two sorts of *Thielaviopsis*, that is, that from the pineapple and that from the cane, are two different races. They are one and the same, and hence it follows that in all probability the experiments carried out at the Planters' Experiment Station are directly applicable to the pineapple. This means that the rot can be prevented from entering the pineapple "set" for some time by simply smearing the cut end with Bordeaux mixture or tar. It is probable that in time, even if not at present, this is an operation that will pay well, for the reason that it will enable the "set" to establish itself to better advantage. The pineapple tops need not be dipped—only smeared at the cut end.

ROTS OF THE PINEAPPLE AS AFFECTING THE TINNING OF THE FRUIT.

There are a number of rots of the pineapple that affect the fruit in such a way that it often comes to the factory for tinning in a state that calls for special action. If the fruit is attacked in one small part only and the rot is in its initial stages, it may be possible to utilize the portion of the fruit not attacked. Such fruits naturally will form a second-grade product.

Another question of importance in this connection is the transition of the fruit from a ripe or healthy condition to the rotted condition. This change may be of such a nature that it is not easy to detect the early stages of the rot. In such cases there is danger that fruit in the incipient stages may find its way into the first grade. In appearance it may be up to grade, but the presence of the rot, though it may not affect the appearance, does affect the flavor. The lack of bouquet, or it may even be bad flavor, develops after the fruit has been canned for some time, when the evil has spread from one or two bad slices or places to the other parts of the tin. It is important for the consumer, as well as the packer, to know the appearances that indicate an unsound tin of pineapple.

It is usual to speak of tinned pineapple of the kind as "over ripe." This is only another way of saying that it is infested by some fungus or microbe,—in the case of pineapples, probably some fungus.

The golden rule is to become familiar enough with the appearance of first-class fruit to know it at sight, and to be very suspicious of anything that has any other appearance. This is possible for the packer and his employes, but it is not an easy thing for the consumer, who, it may be, buys only occasionally. The accompanying photograph shows the appearance of fruit of second quality or deleterious quality.

EXAMINING PINEAPPLE THAT HAS BEEN CANNED.

The examination naturally is directed toward the isolation of any fungus elements that may exist in the discolored areas. At first the cellulose walls of the pineapple cells present appearances that need to become familiar to the observer. Then the nuclei of the pineapple cells simulate organisms in some instances. The granules of the protoplasm also simulate microbes. After one has become familiar with the more or less deceptive appearances he is ready to go on with the search for the traces of deleterious organisms.

Where the cell nuclei of the pineapple are unaltered, and the granular appearances indicative of the protoplasm are present, one naturally does not expect to find traces of such organisms in abundance. On the contrary, where the cell nuclei are absent, and the cells show other indications of disorganization, there the observer pauses to look carefully in the hope of finding the culprits that are responsible for the poor quality of the pineapple or the "going bad" of the tins.

One of the most abundant organisms in tins that have swollen or have burst through the action of fermentations are the yeast organisms and similar cells. These will be present in all tins that have the ordinary odor of fermentation. In cases where the odor differs from this characteristic, alcoholic or sour odor of fermentation, the organisms will be different and may even in some cases take on the character of mycelium.

It is not often, however, that one may expect to find living mycelium. More often the mycelium will be such as was present before the cooking process, and therefore such as has been altered by that process. In general, the stained portions where the cells are most altered have a definite relation to the location of the fibrovascular bundles of the fruit. The axis of the pine is composed largely of fibers or fibrovascular bundles. From place to place the central bundle of fibers gives off groups of strands or fibrovascular bundles, these bundles corresponding in number with the carpels or points or prickles on the surface of the fruit. When a slice of pine is discolored as shown in the photograph, it will be found that it is these groups of bundles that are stained, and that the stain is therefore associated with the vascular axis of the carpels. So far as the stains extend, there are as many stains as there are carpels. It is a noteworthy fact that the fungi of pineapple diseases are associated with staining of the fibrovascular bundles, very likely because they have very definite relations to air. Air is present in the bundles, and it is this fact, perhaps, that determines the line of attack of the fungus. When the pine goes wrong from the root end, as is sometimes the case with *Thielaviopsis*, it is easy to see that the effect must be about that seen in the case of the slices that have "gone off" after tinning. The chemical influence of the rot will extend in advance of the rot along the vascular bundles, as in the case of cane and other plants.

In spite of all precautions, it is to be expected that some fruit will rot on the field. What should be done with this rotten fruit? It should be destroyed, by fire or otherwise. Moreover, the stumps of such rotten fruits should be immediately dug up and destroyed at the same time. All the

stumps that are left on the field are more or less liable to take the *Thielaviopsis* rot, and for this reason it is very desirable to remove these stumps rather than let them rot on the field. If they rot on the field they are pretty sure to become a factor in the generation of some disease of the future crop. So long as pineapples are to follow pineapples, the greatest care should be exercised to *keep the fields clear of rotting or decaying parts of pineapple plants, whether fruit, leaves or roots.*

The industry is expanding rapidly in Hawaii, and in consequence tops are worth two or three cents each. All tops that will grow are being used, to a large extent, regardless of whether they are diseased or not. If the top fails it is replaced by another. This at first may seem to be an economical operation, as it gives the poor top a chance to show what it can do. If it fails, another can be put in. But the *ground at the place of this failure becomes infested*, hence the practice is a bad one, taking the future into consideration.

The old stumps are for the most part being plowed in. This is a bad practice where pineapples are to be followed by pineapples. Examination of the old stumps shows that they are infested with fungi, among which is *Thielaviopsis*, and when this is the case this disease is being encouraged by allowing the stumps to remain. There seems to be some little attempt to burn the trash, but too little. All pineapple trash is inimical to subsequent pineapple crops.

Where the water stands about a plant in the early stage, before it has established itself, the plant suffers and often dies. This is due to disease, often *Thielaviopsis*, entering at the base and getting ahead of the roots of the plant. Proper drainage will remedy this local dying off of young plants.

On some low lands the plants become yellow and die off, or, at least, do not do well. This is a separate malady. The soil at Wahiawa, Oahu, is said to lack lime. If this is so, liming should be tried, especially at the low and poor patches.

Plants occasionally die from the attacks of one or more fungi on the leaves. For a long time in advance of the actual appearance of fungus fructifications these diseased leaves may be picked out by their different color. The attack begins at the tip of the leaves and works back. In any event, sooner or later, these fungi attack the leaves, and it is probable that a closer study of some of them might disclose facts of importance in reducing losses. I have made a number of notes regarding some of these fungus species which may be worthy of publication at some future time.

It is evident that at Wahiawa the common ripe rot of the pineapple is *Thielaviopsis ethaceticus*.

Carpophilous beetles are very common, and these, no doubt, spread the *Thelaviopsis*, as is the case with this fungus in cane fields. If old stumps and worthless fruit were promptly destroyed, the beetles would be less harmful in spreading this fungus.

Flies are very common about the canneries, and no doubt serve to spread some of the diseases, as noted on pages 130-131. It is very difficult to see how they can be kept out of the canneries without expensive screening. The neighboring stables are fine breeding places for flies. The dung heaps should be screened, or, at any rate, so treated as to reduce the flies. This is an operation that will amply repay the cost.

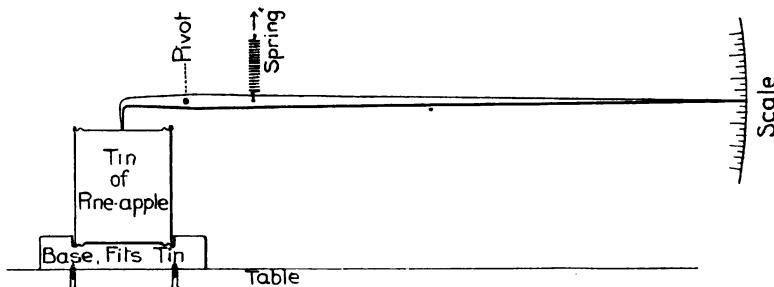


Fig. 9. Sketch of a caliper for tinned fruit.

In the course of my investigations on tinned fruit it has been necessary to know what tins were swelling, and the rate of swelling. The accompanying figure will illustrate the nature of an apparatus I have devised for this purpose. It is simply an application of the ordinary, spring micrometer caliper. Such an instrument may be of use in pineapple canneries, and for that reason the illustration has been inserted. The tin to be adjusted is placed on a base which fits it and holds it in such a position that one end of the caliper lever touches the center of the top of the tin. It is necessary that this adjustment be such that whenever a tin is inserted in the apparatus, so long the tin remains constant the caliper point will assume its former position. The apparatus will be readily understood from the lettering. The caliper lever is pivoted so that the short arm is next the tin to be tested and this arm may be made any number of times shorter than the long arm which swings past the scale. The scale may be arbitrary or it may be made to indicate a given length of tin, the zero of the scale being naturally the upper surface of the baseboard which receives the tin. The apparatus should be constructed of light metal and be of such character as to be permanently accurate. It need not be expensive. Such an instrument would be of use to the Manager of a cannery in investigating the rate at which tins of pineapple change owing to the various circumstances that occur during the manufacture and trade in his product.

COLLEGE OF AGRICULTURE AND MECHANICAL ARTS.

APPOINTMENT OF THE BOARD OF REGENTS.

The Governor has appointed the following Regents of the College of Agriculture, who have been confirmed by the Senate: Messrs. W. G. Smith and A. Gartley for the term of three years; Messrs. Marston Campbell and C. F. Eckart for two years and the Hon. H. E. Cooper for one year.

VOL. IV

JUNE, 1907

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform Hawaiian readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER & AGRICULTURIST

VOL. IV

JUNE, 1907

No. 6

OUR NEW COLLEGE OF AGRICULTURE.

ITS WORK, OPPORTUNITY AND FUTURE.

Farmers' Institute Meeting.

The recent action of the legislature in setting aside an appropriation to found a College of Agriculture and Mechanic Arts in the Territory, was the occasion of a special meeting of the Farmers' Institute of Hawaii at Oahu College, on May 25th last. A representative gathering of prominent agriculturists and educationalists was in attendance, and the future sphere of work of the new institution was fully discussed. Among the speakers of the evening who had kindly consented to present certain phases of the subject were members of the Board of Regents of the new College, the President of Oahu College, the Principal of Kamehameha Schools and other gentlemen. The following addresses were delivered:

MODERN AGRICULTURAL EDUCATIONAL IDEALS.

By Jared G. Smith, President Farmers' Institute of Hawaii.

The land-grant colleges, established by the Morrill Act of 1862, are in every instance a joint product of the Congress of the United States, and the legislature of a given State, that is, of the Nation and the State combined. The Morrill Act of 1862 prescribes the scope of instruction at the college as being: "Without excluding other scientific and classical studies, and including military tactics;" to teach "such branches of learning as are related to agriculture and the mechanic arts, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life." The second Morrill Act of 1890 provides for education in "agriculture, the mechanic arts, the English language, and the various branches of mathematical, physical, natural, and economic sciences, with special reference to their application in the industry of life."

Senator Morrill, the author of the organic laws under

which these institutions have been established, has in his public writings often voiced his own interpretation of the original intent of the laws. He urged that the object of these colleges was "to give an opportunity for those engaged in industrial pursuits to obtain some knowledge of the practical sciences related to agriculture and the mechanic arts, such as they could not have obtained at the classical colleges. It was never intended to force the boys of farmers going into these institutions so to study that they all should become farmers. It was merely intended to give them an opportunity to do so, and to do so with advantage if they saw fit." I quote again, "The Act of 1862 proposed a system of broad education by colleges, not limited to a superficial and dwarfed training, such as might be supplied by a foreman of a work shop, or a foreman of an experimental farm." "If any one would have only a school with equal scraps of labor and of instruction, or something other than a college they would not obey the national law."

The College of Agriculture of Hawaii is the forty-ninth institution to be established under the general provisions of the national organic laws. The agricultural college is of necessity a part of the public school system of the Territory. It is "the people's university." Some of its requirements are that tuition shall be free to students resident in the Territory, or as nearly so as conditions will permit. The course of study must be such as to meet the wants of the people at large. "Whatever limitations other institutions may with propriety prescribe, this Agricultural and Mechanical College must have regard to what the people want to know and to do." The public high schools and preparatory schools should be accredited or approved by the college in so far as their work is worthy of approval, so that good students upon completing their studies in the secondary schools may find a natural entrance to their college unobstructed by terrifying examinations. A close, intimate, and friendly relation with the secondary schools must be maintained. The college should stand for the best ideals in education from top to bottom, and it should make higher education as attractive as possible to the average citizen. Its relation to the public school system is simply to complete the work already begun; to gratify the ambition already inspired, and to make of the average man who wishes it, a strong, capable, useful, high-minded, broad-visioned citizen. Training for mere manual skill should be eliminated from courses that lead to degrees. Not one of the mainland agricultural colleges now require compulsory manual labor. The labor now required in agricultural colleges is on an educational basis, mainly laboratory work.

The ideals should be high. The institution established by the Legislature of 1907 is fortunate in that full and complete

advantage can be taken of the experience, failures and successes achieved during the last forty-five years by the older colleges on the mainland. The key-note of the whole system of the State Agricultural Colleges is that which is emphasized in the fundamental law that the education must be a *liberal* one. The ideal should not be to train the men and women to fill some particular niche in life, but to produce, rather, broad and well rounded men, capable of succeeding in any walk of life. As a dual organization having a direct relationship with both State and Nation, it must give its students training in the humanistic as well as the most advanced technical ideals. As a prominent educator has recently said, "there is too much illiteracy among college graduates." Scientific teaching is essential, but the foundation should be upon broader lines, so that the product shall not be a half-educated specialist;—teaching the students that "the only way to have the good opinion of all the people all the time is to deserve it; and that the only thing of permanent value in the universe is character." A liberal education must embrace an acquaintance with some other languages than our own, in order that we may know how other men think, reason, imagine, or express themselves in oratory and song. The study of literature, to acquaint the student with its buried wealth of thought and life, that he may know mankind at its best; history, for its lessons in humanity, its teachings of law and liberty, motive, passion and action, and the progress and development of human life; political science and economics, that the men who go forth shall become the makers of opinion and a source of action in a free state; psychology and ethics, the sciences of mind, thought, and conduct; military science, because the progress of civilization is intimately dependent upon it; religion, because the thinkers and leaders of our civilization must have that reverence for the divine side of human nature which is the guardian and inspiration of all the rest. These are the broad humanistic studies in the university man's preparation for a full and liberal life.

ACTS FOR THE ESTABLISHMENT OF LAND GRANT COLLEGES.

By Hon. Henry E. Cooper, Regent of the College of Agriculture.

The Agricultural Colleges of today look to the Morill Act of July 2nd, 1862, as the law that has provided for their organization and maintenance. On the 14th day of December, 1857, Hon. Justin S. Morill of Vermont, Chairman of the Committee on Agriculture, introduced in the House of Representatives a bill appropriating to the several States a portion of the public lands for the purpose of encouraging institutions for the advancement of agriculture and mechanic arts. Strange

as it may appear, opposition to the bill manifested itself at once and four months after its introduction the Chairman of the Committee on Public Lands, Mr. Cobb of Alabama, reported the bill adversely but it finally passed the House of Representatives by a small majority and passed the Senate in the winter of 1859. It was soon returned, however, with a veto from President Buchanan. In 1862 the same bill was introduced in the Senate and passed on the tenth of June by a vote of 32 to 7. The bill then went to the House. On the 17th of June it passed by a vote of 90 to 25 and on the 2nd of July became a law by the approval of President Lincoln. Under the Morill Act, the amount of public land was apportioned to each State equal to 30,000 acres for each Senator and Representative in Congress. The lands were to be selected from the public domain subject to private entry and in the event of there being no public land within a State subject to entry, then the Secretary of the Interior issued land script to such State, which could only be located by individuals so that no State could locate or own land within the boundaries of another State. The funds derived from the sale of lands and land script were to be invested in stock of the United States or the States, yielding not less than 5 per cent. interest. The funds so invested were to remain undiminished as a permanent endowment fund, the interest to be used for the maintenance and support of at least one college where the leading subject should be, without excluding other scientific and classical studies and including military tactics, such branches of learning as are related to agriculture and the mechanic arts.

Nearly \$3,000,000 have been derived from the sale of land script issued for the allotment to the State of New York. This fund has been placed at the disposal of Cornell University. Massachusetts was not so fortunate in the disposition of the lands derived under the Morill Act. The share apportioned to Massachusetts was 360,000 acres and only \$207,000 was realized from the sale of the lands; while Kansas received only 90,000 acres, still by judicious selection of lands, something over \$550,000 were realized from their sale. In all about \$12,000,000 have been realized from the sale of land and land script and something over \$4,000,000 worth remain undisposed of.

The next act of importance was passed in 1887, which has been known as the Hatch Act. This had for its purpose the construction of experiment stations in conjunction with the colleges established under the Morill Act. Under this Act \$15,000 was made available for each experiment station out of any money derived from the sale of public lands. Under this last act about \$700,000 annually have been expended on

the maintenance and upkeep of the stations in the several States and Territories.

In 1890 another act of Congress was passed authorizing the application of a portion of the proceeds of the public lands for the more complete endowment and support of the colleges of agriculture and mechanic arts established under the provisions of the Morill Act. By this last act \$15,000 was made available for each college, this appropriation to be increased annually by addition of \$1000 until the total amount reached the sum of \$25,000. Now the Nelson Act provides an increase in the amount of the appropriation to each State of \$5000 a year for 5 years at the end of which time the appropriation will be \$50,000 annually.

The next act which particularly affects our own people was passed by the Legislature of the Territory of Hawaii during its last season. The purposes of the college of Hawaii are to give thorough instruction in agriculture, mechanic arts and the natural sciences connected therewith and such instruction in other branches of advanced learning as the Board of Regents shall from time to time prescribe, and to give such military instruction as the Federal Government may require. The standard of instruction in each course shall be equal to that given and required by similar colleges on the mainland, and upon the successful completion of the prescribed course the Board of Regents are authorized to confer a corresponding degree upon all students who shall become entitled thereto.

It was quite natural that there should be a diversity of opinion concerning the purpose of the colleges authorized by the Morill Act, sometimes referred to as the Land Grant Colleges. It was the opinion of some that they were designed as Manual Training Schools, in other words, to attempt to make farmers of the students without respect to scientific acquirements. The purpose for which the colleges were instituted as intended by the original introducer of the bill, Senator Morill, may be best explained in his own construction of the act.

His idea was to give an opportunity for those engaged in industrial pursuits to obtain some knowledge of the practical sciences related to agriculture and mechanic arts such as they could not then obtain at most of our institutions called classical colleges. It never was intended to force the boys of farmers so to study that they should all come out farmers. Not manual but intellectual instruction was the paramount object. It was not intended that agricultural labor in the field should be practically taught any more than a mechanical trade of a carpenter or blacksmith should be taught. It was a liberal education that was proposed. Classical studies were not to be excluded and therefore must be included. The act of 1862 proposed a system of broad education by colleges

not limited to a provisional training such as might be had in an industrial school.

So much for the present laws under which we are organized and are to act.

We require still further legislation by Congress. Rulings to the effect that Colleges established in Territories subsequent to the passage of the act of 1890 cannot participate in the appropriations, makes it necessary that an enabling act should be passed by Congress making available to the College of Hawaii all Federal appropriations. The appropriation from the Territory will permit of a very small beginning only: \$10,000 for salaries for the biennial period, \$5000 for incidental expenses and \$10,000 for buildings. This will not go very far towards providing accommodation for the many students who will no doubt make application for admission to the college as soon as buildings and teaching force have been provided. What we want is sufficient opportunity to teach the young men and women to be able not only to be successful farmers themselves but to teach others how to avail themselves of the natural advantages which are so little known by those who have not been able to receive a liberal education on scientific lines.

AN INTERPRETATION OF THE ACT.

By Wallace R. Farrington, Editor Evening Bulletin.

As I understand your secretary's request, an interpretation of the act creating this college is to be discussed by me with relation to its historical origin rather than a legal definition.

Since coming to the Hawaiian Islands I have been struck with the lack of opportunity for advanced education for the youth unable to personally afford or borrow the funds for a course at some mainland college or university.

Shortly before the close of the session of the 1905 Legislature I framed the resolution which was later introduced by Representative Coelho of Maui calling on the Commissioners of Public Instruction to investigate the feasibility of securing the Federal endowment for and the establishment of a College of Agriculture and Mechanic Arts. This resolution was passed without opposition by the House of Representatives and was later passed by the Senate with the amendment proposed by Senator Dickey that the Lahainaluna school should be considered in this connection.

As a member of the Board of Public Instruction I was appointed chairman of the committee to carry on this investigation and report. I visited Lahainaluna and after going over the situation confirmed a preconceived idea that it was not

the institution from which the college could be developed. It is doing a good work in its own sphere. Its graduates are equipped to enter the first or second year of the High School. Hence it is in no sense a college nor does it furnish the basis for one. Its attendance of over one hundred students shows that it has a place to fill as an industrial school. It is also distant from the center of what educational advantages we have in the islands, and to try to make a college of the place would be to guarantee a low grade college and spoil a first class industrial school.

Our report was accepted by the Board of Public Instruction and presented to the legislators. The Governor also took an active interest in the work of getting the institution started. A plank in the Republican platform endorsing the project was secured.

While the Legislature of 1907 was in session everything was in good shape except for the framing of the act creating for the institution. This was an all important detail, and we were fortunate in securing the appointment of a special committee from the members of the University Club. This committee consisted of Hon. H. E. Cooper, C. R. Hemenway and R. S. Hosmer. They coöperated with A. G. M. Robertson and the result was the law establishing and the law appropriating for the Hawaii College of Agriculture and Mechanic Arts. The bills were introduced by Senator Coelho of Maui and were, as has been said by Mr. Cooper, passed without opposition.

Some one has said that the act creating this college should be entitled "An Act to Secure the Federal Appropriation for Hawaii." As one of those having to do with the early work for the institution, I desire to "acknowledge the corn." That was exactly what I had in mind and as I read history the Morrill Act was originally passed to inspire the States and Territories to do just what Hawaii has done and what every other State and Territory of the Union did before us.

While this is a meeting of agriculturalists, I do not believe that the scope of this college should be exclusively agricultural. It should be a college of agriculture and mechanic arts in fact as well as name. It must be if we are to obtain the Federal appropriation. It must be if we are to give our youth an opportunity for a liberal advanced education.

Nor am I altogether in sympathy with the idea that this institution will not be doing its work unless it turns out farmers. I am convinced that each man should determine for himself his future field of work. I shall not consider this college a failure if it turns out more chemists, or mechanical engineers, or civil engineers, than farmers. There is as much reason to claim that a man should put hayseed in his hair and fertilizer on his feet in order to be at home in a farmer's in-

stitute meeting, as to hold that this college must produce only farmers.

I think this college should be in Hawaii what similar colleges are and have been on the mainland—an institution where the young men and women can obtain a college education and follow the course of study that best suits their ambition.

Presumably future legislators of Hawaii will rise up and cry out as they have done year after year in my home State, "Where are your farmers? Where are your farmers?" The college will fill its mission if it turns out well educated men and women, whether they elect to go into the cane field and hoe, or into the chemical laboratory. Its purpose should be to furnish the opportunity for advanced education. If this be satisfied I am willing to leave the rest with the young people of our Territory. I believe the college will be here as elsewhere in the country—a perfect success.

EDUCATIONAL STANDARDS FOR THE COLLEGE OF AGRICULTURE AND MECHANIC ARTS.

By Arthur F. Griffiths, President Oahu College.

The more I consider this problem of the founding of the new College of Agriculture and Mechanic Arts and the establishment of proper courses in it, the less easy seems the solution. It is going to be difficult for instance to plan a course for a college which has no site or buildings or students in a country where there are no farms. It is not going to be possible to follow entirely, or much, the lines laid down by the experience of other colleges; it is not going to be wise to do so.

As I understand it, the desire of the Regents of the college in Hawaii is so to plan the course that it shall entitle them to a portion of the Federal appropriation. That means a college to which perhaps no exact definition has been given, but yet clearly above the grade of a high school or academy.

The law says that the function of the college is "to promote the liberal and practical education of the industrial classes; its leading object to teach such branches of learning as are related to agriculture and the mechanic arts * * * without excluding other scientific and classical studies." Each is under obligation to provide "instruction in agriculture, the mechanic arts, the English language, and the various branches of mathematical, physical, natural, economic science with special reference to their applications to the industries of life." In addition to agriculture and the mechanic arts, the law says specifically that military tactics shall be taught. I am afraid

that there may possibly be some misconception in some quarters as to what this means for I know of no place in the world where the word college as applied to institutions of learning is more of a misnomer than here in Hawaii. The new college should be a college in fact as well as in name. It should ultimately require the completion of a four years' high school course of study as a requisite for admission to its Freshman Class, and then seek to maintain strong four-year courses in agriculture and in the applied sciences. For economy's sake, at least, there should be no duplication of the work done at the people's expense at Lahainaluna or of the courses at Kamehameha or at any of the other schools.

A great many similar colleges in the sparsely settled sections of the West have courses which are hardly better than high school courses, but their excuse is that there are no good high schools from which to draw students. Other colleges have sub-freshman or preparatory departments to meet this difficulty. But with at least two schools of high school grade in Honolulu and others on the way outside, the College of Agriculture and Mechanic Arts, providing it has attractive courses, ought to draw some students who are prepared for their work. I believe, too, that for some time at least the student body will not be so large as to crowd even modest buildings. I trust that numbers will not ever be an inducement for lowering the educational standards.

It has been a noticeable feature of similar colleges in the East that they tend more towards the mechanical and engineering side than towards the development of agriculture. The standards for this work are well established by our Eastern scientific and technical schools. The college can afford only to offer courses that will give the best training. That will probably mean a limited field within which the training shall be adequate and thorough. It is well that the mechanical industries are so closely connected with agriculture. Courses can be planned and carried out that will prepare young men for our main industry, as well as for other mechanical pursuits in the Territory. This means not merely the training of men for a trade, but also the making of skilful, thinking engineers and mechanics.

The main purpose of this college—especially on its agricultural side—is to raise up leaders. This Territory practically has no farms. Before it has farms and profitable products, the principles of agriculture that can be successfully applied to our peculiar local conditions must be studied and applied not solely by the professors in the college and investigators in the experiment stations, but also by farmers in the field who have been trained in the science and who can tell after an experiment why they have succeeded or failed. On the basis of scientific experimentation by the college professors and by

the various scientists in the experiment stations, and with a knowledge of the principles and practice of agriculture and a trained mind for grasping new problems, these students should go out into the fields of Hawaii and demonstrate by actual production and sale of crops, not once or twice but all the time as a means of livelihood, that agriculture is to be an economic factor in the Territory's development.

If the college is going to raise up leaders, it has got to have the material out of which to fashion them and the tools and equipment by which the moulding process may be done. The college can not open its doors to every boy on the street who can neither understand what he is told nor comprehend what he reads in the simplest text book. The students must have training; they must be able to understand and comprehend the instruction; they must be able to apply the principles that they learn to practical problems. It needs no provisions in the Federal statutes, which say that you must have a college with such and such courses or you can not have Uncle Sam's money, to prove that the best interests of the people of the Territory demand that high entrance requirements be imposed and such a course of study planned as will guarantee that students of ability be in the courses—students who will make thoughtful, studious, progressive men. Some one has said that an agricultural college is not to teach boys to hoe, but when and in what soil to hoe.

In discussing educational standards here tonight, happily it is not my duty to outline entrance requirements or to plan the college course. That pleasant task falls on the Regents. That there is great divergence in what shall constitute a proper course is shown by these statistics which I read some little time ago, showing per cent. of courses given in two colleges in the three main groups of studies:

College	Culture	Non. Tech. Scien.	Technical
A	49.9%	24.6%	25.4%
B	8.1	39.3	52.6

In spite of this great diversity of courses, each is a prominent college in States not dissimilar in interests and development. All the other colleges ranged between these two extremes.

At about the same time the Association of American Agricultural Colleges and Experiment Stations adopted the following list as a minimum requirement in general studies:

Mathematics: Algebra, geometry and trigonometry; three years.

Physics and Chemistry: two years.

English Literature and Language: two years.

Other languages: four years.

Mental Science or Logic or Moral Science: one year.

Constitutional Law: one year.

Social, Political or Economic Science: one year.

This does not seem like an exorbitant requirement. This would constitute about two-fifths of the work, the other three-fifths being technical scientific subjects.

And as a minimum for entrance requirements, they united on

1. Physical geography;
2. U. S. history;
3. Arithmetic;
4. Algebra to Quadratics;
5. English grammar, composition and literature.

Except in English literature, our Punahou Freshman would have much more than this requirement.

Of course, the better colleges did much more than this. But this shows that the new college in Hawaii can and must start with a standard no lower than that, and if it is a good deal higher, it will more nearly meet the peculiar conditions here in the Territory.

This Territory needs first a body of agricultural science after which will come a genuinely scientific agriculture. Through the experiment stations—Federal, Territorial and private—a considerable agricultural science has been developed. The results of these years of actual study and experimentation should be available for the new college. They are, of course, generally to be had for the asking; but I believe that they should be brought into direct and specific use by having the scientific men of the station either personally connected with the staff of the college, giving a part of their time to the instruction in the college or in some less direct way affiliated with the new institution. The valuable knowledge of soils and products, of crops that may and may not be grown profitably, of proper methods of cultivation, and of all the details which these stations have been accumulating for years through experiment and trials should be quickly and thoroughly put to use in training the incoming generation of agriculturists. The investigator in the stations might very well be a teacher in the college. While the work in each should be distinct, the two can well coöperate.

The college must have such a judicious combination of the so-called literary subjects with the scientific and technical subjects and must give such a good, genuine broad education in these subjects as will make not men who have received just enough knowledge to become dangerous, but men who will make the industrial pursuits worthy callings for educated men and who will bring blessings to this community by increasing its resources and profitable products.

WHAT THE COLLEGE CAN DO FOR HAWAII.

By Walter G. Smith, Editor Pacific Commercial Advertiser, Regent of the College of Agriculture.

It is a very general feeling that the new College of Agriculture should do whatever, within its legal scope, will help Hawaii most. That duty seems to be to encourage, stimulate and bring about, the diversification of our farm industries. Sugar is quite able to look after itself. It has its own scientific laboratories, its own experimental farms, its large staff of trained men, its fine record of achievement. It does not seek or require the scientific aid of the college about to be founded. But tropical farming does need such aid. It asks the help of young men trained to find the right soil for the right crop, to protect that crop from pests, to improve the quality of the product and the magnitude of the yield. If Hawaii can train enough young men to this service then it may regard its future with satisfaction. Idle acres will eventually be turned into good farms. All our industrial eggs will not be carried in one basket. Prosperity, now the privilege of the few, will become the happiness of the many. The Territory will be in shape to get the substantial middle class it needs to "develop along typical American lines." It is a fair question: Could the new college have a more useful mission than this? Is there any worthier work for it to do?

The dream of a Hawaii of farms and homes is not an illusive one. There is nothing in frost and ice and rugged soil and angry skies to guarantee a success in agriculture which is denied to sunshine and rain, fertile volcanic earth and temperate breezes. People who go into farming for staples and make money in competition with millions of others have no reason to fear the results when they go into farming for luxuries, which everybody wants and but few produce. Instead of being a place to avoid in agriculture, Hawaii is a place to seek. Sugar uses but 200,000 acres out of a total area, good and bad land, of 4,250,000 acres; and there is room for a multitude of people to grow other things than sugar. To help them do it would appear to be the best and highest object of the College of Agriculture.

THE RELATION OF SECONDARY EDUCATION TO THE AGRICULTURAL COLLEGE.

By Perley L. Horne, Principal Kamehameha Schools.

Secondary schools usually include schools below the college and above the intermediate and low grammar. In Honolulu, secondary schools would naturally include Oahu College, the

High School, the Normal and the upper classes of Kamehameha. The last named school, while below the grade of the others in strictly college preparatory work, is equal to them and perhaps ahead in scientific and mechanical work. In mechanical and freehand drawing, in nature study, in domestic science, in the scientific study of chemistry and physics in relation to daily life; in scientific agriculture, and in shop work of all kinds, Kamehameha will easily bear the test. In purely academic work, she must be content to rank below the others.

But for the purposes of this paper, I think that I may rightly include Kamehameha in the list of schools whose students will rightly claim the advantage of the new agricultural college.

The presence of such a college in our midst will necessarily bring changes in the course of study in all these schools, to prepare young men and young women better to take up the advanced work of the college. The new college is to be something more than a farm: and its students are to be something more than tillers of the soil. The secondary schools are to be the natural feeders of this college. To do this well, new courses of study will need to be developed in the secondary schools along scientific and agricultural lines. More nature study work, preliminary courses in agriculture, domestic science, manual training and allied subjects must be more fully developed.

To do the best work, the college must receive into its regular courses students who have some elementary knowledge of these subjects. Preparation of this nature will be as valuable as work in classics, advanced mathematics or modern languages, admirable as these latter are.

The elementary work the college ought not to be expected to do. However, this paper does not have to deal so much with what the college is to be or do as with what the secondary school should be to help best the college. This I believe the college will help determine.

I believe fully in industrial education in the secondary schools; the training of the hand as well as the head and heart. By industrial training, I do not mean alone shop work, but scientific study of every kind, also agriculture in its various departments, and practical and social and civic problems. Each secondary school should have its beginning courses in gardening, horticulture, forestry, agriculture, as well as in arithmetic and history, not only to interest the young in these vital phases of life, but to arouse their love of all that pertains to the plant and animal life of our universe. A school of advanced study in such subjects would of a right expect elementary work along such lines in the schools that naturally supplied students to it.

Special requirements for admission must be met. To read, to write and to cipher, will not be enough. The college will have a right to expect its young men and young women to have a fair training in the common English branches, and to have some knowledge of plant life, of insect life, helpful and harmful, of the elements of the soil, of gardening, a fair knowledge of the fruits and trees of their home land. This knowledge to be universal in the Territory cannot be left for the home to impart, but must be given by the schools. These questions are of as great educational value as any subject studied and of far greater practical value than many subjects taught. The presence of the college will be a great stimulus to all scientific study in our secondary schools. So soon as the general requirements for admission are laid down by the Regents and the new faculty, at once the duty of all the secondary schools will be to furnish courses of study to meet these requirements so that the young people of our Territory may speedily avail themselves of the fine opportunity the new college will offer.

And yet the doors of the college ought not to be closed to those whose privileges have been restricted and who are mature students, to avail themselves of certain lines of research in special work made possible by the college. Here the college can offer a splendid opportunity for special students. Young men and young women who wish to pursue some special line of research, but whose academic preparation does not fill the general educational requirements for admission should have the privilege of entering to study their special field. For instance, a young man may wish to study chemistry, to prepare himself to be a chemist upon a plantation, or in the fertilizing works. Given a fair general education, a mind capable of grasping the subject wished, and a purpose to do the work he wishes, the student should receive every encouragement that he may get the start he seeks. Or if some one wished to study dairying or poultry-raising, veterinary, or bacteriology, the chance should be given if certain conditions are met.

But I wish especially to emphasize one phase of the general question. The new college cannot afford to set its requirements too low. Better to begin with five pupils well prepared, and keep the standard high than to begin with twenty-five at a low entrance standard. I think it behooves the Board of Regents to give a very clear statement of the requirements for admission as regular students and the minimum requirement for special work, and the college will do well to emphasize the regular course and to discourage special course, although there will always be a demand for the latter which should be met. The ideal can not be too high. To start with a high standard is easier than to raise that standard. And

yet the full requirements need not be met the first year, although no diploma should be granted unless the full standard is maintained in all the branches of work required for graduation.

Let me present a tentative program for admission as a basis for argument, and in this rating my plan has been to follow somewhat those adopted by the better class of colleges on the mainland, differing in details to meet local conditions.

I recommend that thirty-five points be required for admission as a regular student. That the following subjects rated as indicated, twenty-seven points be required of all regular students and that subjects aggregating eight points be required elected from other subjects:

SUBJECTS REQUIRED FOR ADMISSION.

	Points
English	6
History of Hawaii	1
History of the United States.	2
Arithmetic including the metric system.	2
Algebra through quadratics.	3
Plane geometry	3
Island nature study (a three years' course)	4
Elementary physics	3
Elementary chemistry	3

ELECTIVE SUBJECTS FROM WHICH 8 POINTS ARE TO BE CHOSEN.

	Years	Points
Latin	3	4
Elementary French	2	2
Elementary German	2	2
Advanced German	1	2
Advanced French	1	2
Advanced Algebra	1	1
Solid Geometry	1	1
Trigonometry	1	1
Advanced Physics	1	1
Advanced Chemistry	1	1
English History		2
Oriental History		2
General History		2
Freehand Drawing		2
Mechanical Drawing		2
Architectural Drawing		2
Projections		2
General Knowledge of Hawaiian, Japanese, Chinese, Portuguese and Spanish, each		2

	Years	Points
Special knowledge of same, each.....	..	2
Bookkeeping	2
Stenography	2
Commercial Law and Business Forms.....	..	2
Carpentry	2
Wood-working	2
Machine tool work	2
Blacksmithing	2
Chipping, filing, fitting	2
Electricity	2
Harmony	2
Counterpoint	2
Civil Government	2
Economics	2
Physiography	1
Botany	1
Zoology	1
Astronomy	1
Anatomy, Physiology, Hygiene	2
Meteorology	2

This wide range of subjects would allow great freedom in preparation.

I recommend that the 35 points indicated be required of the entering classes in 1907-1908, 1909; that in 1910, the required number be 37 points, i. e. 10 electives; in 1911, 39 points, and in 1912 and thereafter 41 points or 14 points for the elective list.

I recommend that the requirements in each subject designated be explicitly stated by the faculty of the college, so that each preparatory or secondary school may know exactly what will be required in each subject.

I recommend that no student be allowed to enter as a regular who shall fail in ten points, that no student be allowed to graduate from such college until he shall have completed the regular prescribed course of the college and have passed off all entrance conditions or completed an amount of extra work in the college to offset conditions.

I recommend that specially approved candidates who pass 15 points be allowed to enter the college as special students to pursue such course or courses of study as the faculty may approve. The terms of their certificates from the college would naturally be determined by that body.

I recommend that graduates of Oahu College, the Honolulu High School and the Hilo High School be entered on certificate, credit being given only for the points definitely stated by the president or principal of these institutions: that graduates of Kamehameha and Lahainaluna be given credit in

such subjects as the president or principal may recommend, and in no other subjects: that all other candidates be required to pass the entrance examinations.

I recommend that credit be given any candidate presenting certificate from the College Entrance Examination Board in those subjects in which he or she has been examined and passed and in no other.

I recommend that the certificate privilege be taken away at any time from any institutions whose pupils may continue to prove incapable of carrying on the work of the college.

I have presented at some length this tentative schedule. It embraces many subjects, but no more than are presented by our best institutions on the mainland. Some of these subjects may be omitted: others may be added. Different rating of many of the subjects might be made. I present the list with the ratings as a basis for further consideration.

Given a schedule like the one outlined or any other as explicit, the various schools of the Territory would know what to do and would at once fashion their courses of study to meet the requirements. Perhaps the requirement for admission as outlined may seem too hard. But with provisions made for special students I do not believe them excessive, and I do believe that the new college will more quickly get results by setting at the start a high standard and increasing this as time goes on until it will be second to none.

The secondary schools will meet the standard set by the college. If that standard is low, the standard of our public schools will decline, for I hold it almost an axiom, that the highest public institution in any State or Territory will shape the standard of all the secondary schools to meet its requirements. We have the right to demand of this new institution that it rank with the best. The number of students at the start may be small, but that matters not. The ultimate good of the whole Territory should determine the policy. And to my mind the standard of admission needs to be high, that results may be obtained. A slip-shod beginning with low entrance requirements and a snap course, accommodating all who wish to enter, will make the college unworthy the name and will turn out young men and young women with a thin veneer of information that will not bear the test of the hard-headed, horse sense business world of today.

If the list of subjects presented seem altogether too long and too varied, particularly the elective course, consider this: The mere mention of these courses on the list of requirements would indicate to the secondary schools the immense range of subjects that can be taught in our secondary schools. No school could begin to teach all. All schools could teach some and probably more than they now do. The day is past that the school schedule follows absolute and fixed lines. Local

conditions determine and rightly many of the elective courses in schools. A study of the Japanese beetle in the public schools of Hawaii would be a help to the Territory, in Massachusetts, the time spent would be ill-advised. In Massachusetts many of the public schools study the gypsy moth and the potato bug. The study of these insects in Hawaii would not bring results. The same is true of rice culture in New England, no benefit would come, proportioned to the time. In Hawaii the reverse is true.

A schedule of possible subjects to be offered for admission to the Agricultural College, and these subjects well-defined, would act as an inspiration to the public school and would induce a course of reading in the home that would rarely be considered without the impetus of a schedule of possible requirements.

With this final suggestion, I am through. The secondary schools of the Territory have a right to demand that their standard be raised by every possible means. A low grade college will lower the standard. A high grade college will raise the standard and increase the efficiency of our secondary schools, and as the capstone, such a college will grow into a Territorial University, whose graduates will revolutionize the agricultural and industrial life of Hawaii nei.

WHAT SHOULD THE COLLEGE OF AGRICULTURE MEAN TO THE AGRICULTURIST?

By Mr. Byron O. Clark.

The modern agricultural college is the outgrowth of a condition brought about by the wasteful, ignorant methods of soil tillers of generations past.

The day when a worn out farm could be abandoned, and one of virgin fertility obtained farther West for the asking, soon passed; and the agriculturists found themselves face to face with a problem; the worn out soil must be rejuvenated, or they must change their occupation.

True to the American instinct when aroused by necessity, they set about investigating and experimenting; the deeper they went into the subject the more important it grew; and it was necessary to appeal to science through men who, although not practical soil tillers, could give from the scientific standpoint of the chemist, some knowledge of the relations of the various soil elements to each other; how each had its affinity for some other element which, on becoming exhausted from the soil, not only left it deficient in that element, but also made its affinitive element unavailable as plant food.

Often on suggesting the addition of one simple element to the soil, it would grow certain crops to the perfection of olden times. At other times, with other crops, the results were not so satisfactory, and it was in time found that the wisdom of the chemist could not always unlock nature's secrets; this led to coöperative experiments between the tiller of the soil, and the man in the laboratory. Thus from a small beginning arose the necessity for specialized scientific investigation; a fact quickly recognized by some of our colleges, and to a limited extent by the farmers.

The demand for this broader education by our farmers, met with munificent provisions for agricultural colleges by the Federal Government and has grown to such an extent that most of our States and Territories now have well equipped colleges; but I am sorry to say that in some instances, sufficient prominence has not been given to the agricultural features in the truest sense, and in other instances, the farmers have been slow to recognize the importance of the training to be obtained at these institutions by their children.

The founding of such an institution as the proposed Agricultural College of Hawaii, should be one of the most marked forward movements in the development of diversified agriculture in these Islands, that has ever been taken. On account of our unique location, I predict that it will become, within the life time of most of its first Board of Regents, one of the important agricultural institutions of the United States; when students from the mainland and from foreign countries will be interested, seeking to enter its portals.

There never has been a time when tropical agriculture attracted so much attention as at present. We have here a virgin field for investigation, with ideal climatic and other conditions for founding an institution for the study of all that pertains to tropical agriculture. There is no place in the world so well suited for the work which we should take up, as Honolulu.

It should be the aim of this institution to equip our young men and women with a practical, scientific education that will enable them to go upon our hill sides and plains and make them produce to the highest perfection, the various tropical fruits and other products for which these Islands will surely become noted; they should not only be taught the theory of agriculture in all its branches, but they must learn the practical application of the knowledge gained for the benefit of their vocation.

Above all they should be taught the honor, glory and dignity of being able to win a competency from the soil, under adverse, as well as favorable conditions; they should be able to look back in their mature years and say, "I owe whatever success I have attained in my calling to the instruction and

experience received at my Alma Mater—the College of Agriculture of Hawaii."

This institution should be of greater significance to agriculture than to any other industry of Hawaii; it should *mean* more to the soil tiller than any institution to be established here. We are distinctively an agricultural community; excepting sugar we have no well established agriculture in any of its branches; the possibilities are not dreamed of by the most enthusiastic advocates of diversified industries.

This college means that our young people will be taught how to unlock unknown riches now lying dormant in our virgin soil, making it productive, and greatly adding to the wealth of the country; at the same time beautifying hillside and valley with fruiting tree and vine, blooming plants and waving pastures of succulent forage, such as is not deemed possible today, because of our lack of knowledge, and the faith which only comes through knowledge.

The higher education along specialized lines, made possible by this institution, will bring about this transformation. All this, and more is what the College of Agriculture will mean to Hawaii.

*HOME MAKING AND THE ART OF RIGHT LIVING AS
INFLUENCED BY THE COLLEGE OF AGRICULTURE.*

By Miss Minnie Reed, Science Teacher Kamehameha Manual School.

Among the earliest of land grant colleges to be established were the Michigan and Kansas Agricultural Colleges. For twenty-five or thirty years they have led all others in the quality of their work and in their influence upon the citizens of their State.

They have not been fused with their State universities, so have kept their individuality and done their own special work well. They have laid their foundations on broad, generous lines, and have developed fine, strong men and women from the young boys and girls sent to their halls. Sometimes these boys and girls come from very crude homes and from untrained or illiterate parents, but not always; for many students come from cultured homes, either from ranch, farm, village or city. Most of these boys and girls are young, from fourteen to eighteen, and usually they are very much in earnest and anxious to gain the practical training offered.

I know most about the Kansas Agricultural College, so shall tell something about the work it has done and is doing for the homes of the commonwealth. Other agricultural colleges are doing similar work in other States, but no State has as

well-equipped, well-organized domestic science department as Kansas.

President George T. Fairchild, brother of the famous Oberlin president, wisely directed the affairs of the Kansas Agricultural College for nearly twenty years and laid the foundation on broad, practical lines. He was one of the earliest advocates of the laboratory, manual or technical training, along with the scientific and English work, in agricultural colleges. After much opposition and against many obstacles, he demonstrated the advantages of such training for the students under his care. He always said, "We learn best by doing; so we must have adequate laboratories for the sciences and shops for the manual and technical training." He often said, "Our students are young enough to graduate here; then go to the university for the higher training; for we train the head and hand together." He believed this so thoroughly that he sent his three sons to the agricultural college for their preliminary training, before he sent them on to an Eastern college to take professional studies.

Very early in the history of this college, domestic science was put into the curriculum for the girls, on the same basis as the practical agriculture for the boys; and no boy could graduate without the agriculture, and no girl without the domestic science.

The boys have five hours per week of actual practical farm work in fields, gardens, orchards and in caring for the farm animals; besides class-room lessons and lectures upon agriculture, soils, etc. The girls beginning with the first year have five hours weekly devoted to plain sewing, dressmaking, embroidery, etc., besides lectures on economic and hygienic clothing for women and children. The second year is devoted to cooking all kinds of foods from the plain bread and beef-steak to pies, cakes, puff-paste and French candies. Serving a meal daintily and artistically is also a part of the actual laboratory training; for there is not only a kitchen and range, but a china closet and a dining room, where breakfasts, lunches and dinners are actually served by the girls, who have to act as hostess when the governor and regents, faculty or less august friends visit the college.

Besides this, the girls are taught how to cook for invalids and children, and study the proper balanced ration for the brain worker, day laborer or athlete; and the chemistry of all the staple foods and their relative digestibility.

Fruit canning, the making of jellies, jams, preserves and pickles is put in the last year, along with marketing, for those girls who take domestic science for their major subject.

It is needless to say that many a girl specializes in domestic science, especially if during the four years' study she has considered the proffered partnership of some young farmer and

expects to preside over their home. The young men and women meet freely in class-room and social affairs of the college, and many life-long attachments are formed before graduation. There are also special courses in horticulture and home flower gardening offered to any girl who chooses them, and very many choose to spend two hours per week during their senior year in learning how to raise various kinds of house or garden plants. Under the direction of a genial old Scotch gardener these two hours are a delightful recreation, whether it be in the conservatory or out in the spring sunshine planting seeds or pansies and roses. Every girl also has special lectures in personal hygiene, in the care of a family, in household sanitation, decoration and furnishing; besides, vocal and instrumental music, drawing, designing, etc., are offered to any who choose.

Perhaps you wonder how they find time during these four years for any academic work. All who wish to go to the university must prepare their Latin under a tutor outside of college. The general scientific course requires enough mathematics, science, German and English for entrance into the scientific course of the university; besides the domestic science and agriculture, economics, psychology, etc.

The special courses, as the domestic science course, the agricultural, mechanical and electrical engineering, or other courses, do not give so broad a training, as the specialization begins earlier.

The college also offers short summer courses for teachers and winter courses for farmers or those who can not hope to graduate. These courses include domestic science, drawing, physical culture, floriculture, dressmaking, bacteriology, dairying, crop production, botany, horticulture and various agricultural subjects.

Farmers' institutes are conducted throughout the State by the professors from the college. These are supported in every community by the progressive farmers and their wives, many of the leaders having been trained at the college.

Many of the Kansas farmers are from the best class of New England, so are an intelligent and thrifty class of people. These, of course, receive the most benefit from these institutes and from contact with the men and women who are trained in college.

However, the illiterate foreigners who have settled on the farms are gaining much good from the lectures and demonstrations given at these institutes and from the farmers who have been trained in college. These college-trained farmers and their wives are a great leaven in every community and are leading their foreign neighbors to send their children to college and to improve their homes and raise their standard of living.

What are the results of this training upon the homes and the agricultural interests of the State of Kansas?

First—It has made more efficient and prosperous farmers, hence has increased the value of land and of crops many times over.

Second—It has developed a love for country life not known to uneducated farmers.

Third—It has added to the beauty and comfort of farmers' homes, as many of the farmers' wives have the training that makes them helpful comrades for their husbands and children, as well as good housekeepers.

Fourth—It has improved the community life, for the love for books, music and art gained at college has interested them in libraries and lectures, and in better music and pictures, while enough of the social graces have been acquired to enable them to meet people easily and freely.

Fifth—It has interested them in civic affairs, for all have had some training in sociology and political economy. The farmers of Kansas are alive to social questions and political interests of their State and the Nation. Nothing could illustrate this better than the recent fight with the Standard Oil monopoly. It was the intelligent interest of the farmers of Kansas that made that fight possible and successful.

Sixth—It has greatly improved the rural schools, both in raising the standard for the teachers, in better buildings, more attractive school grounds, and better equipment and furnishings for the schoolhouse.

Seventh—It has resulted in happier homes, in healthier families, stronger, better-nourished and better-trained children; because the farmers' wives have more to make their lives interesting and are better poised and are more intelligent. And yet this is not all, for the Kansas College of Agriculture, for one, has further made good, it may be stated, in that fifty important positions in our National Department of Agriculture are held by its graduates, and as many more are teachers of agriculture in State colleges, and many more are numbered among the State's honored citizens—professional men and women, merchants, and advanced practical agriculturists.

A UNIQUE OPPORTUNITY FOR THE COLLEGE OF AGRICULTURE OF HAWAII.

By J. E. Higgins, Horticulturist Hawaii Experiment Station.

The natural function of an agricultural college is not primarily research, but instruction. It does not discover, but teaches truth. It should take the results of the work of investi-

gators and place it in the possession of the people. This it does chiefly through the young as in all branches of education, but those of the middle aged and the old, who are yet young in spirit should profit much by its teaching.

Until a very few years ago practically all the work of research in agriculture had been done in the temperate zone. It is true that there had been botanic gardens in tropical countries, where collections of tropical plants had been cultivated, but experiment stations or other institutions for the study of the laws of agriculture in the tropics or of the application of known laws to tropical conditions are of the most recent advent. Naturally enough, however, these stations have preceded the institutions for higher agricultural education. The unique opportunity has presented itself to the people of Hawaii to establish the college of tropical agriculture of America. There is today no college on American soil so located and equipped as to supply the needs of the American student seeking instruction of a high grade in tropical agriculture. The need of such an institution is apparent in view of the tropical areas which have recently been added to the domain of the United States. The Philippines, Hawaii and Porto Rico will call for a large force of young men trained in tropical agriculture. A few years ago there were those who prophesied that there would be an over-production of graduates from the colleges of agriculture on the mainland. As the number has grown the demand has increased, and there are today more openings for the hundreds than there were a few years ago for the tens. These young men are demanded not only by institutions for research and instruction, but by private employers in many capacities. The man of wealth with large country estates seeks a manager at the agricultural college or among its men already in the field. Further, the young man of today who intends engaging in agriculture as a private business, if he is alive to his opportunities, avails himself of the advantages afforded by one of the agricultural colleges.

As progress is made in the development of the agricultural resources of Hawaii and other American tropical territory there will be an increasing demand for young men trained in tropical agriculture. I know of a young man who recently received an offer as a plant breeder in the tropics. The offer came from a business corporation, and the remuneration would have been in the neighborhood of \$5,000 per year at the start. This single field of plant breeding will occupy the attention of large numbers of young men in the future, and no field is more promising or will be more prolific in results than the tropics. Little has been done to improve tropical plants and with the exception of a few species, there has been practically no plant breeding. The work of Burbank, which has justly attracted so much attention will be repeated in

many spheres of plant life. Mr. Burbank is a pioneer. By his careful study of plants and the laws which govern the plant breeder and by his never-failing patience, he has accomplished results which seem astounding, but the future will present far more astonishing achievements. Where can the young man who wishes to enter this or other fields of tropical agriculture find a college training adapted to his needs? The College of Agriculture of Hawaii should be prepared to fully equip him for his work. While we cannot overlook the work of preparing young men for agriculture as a business, the College of Agriculture will, in my opinion, fall short of its high opportunity if it fails to give a strong and liberal education to its advanced students, so that they will be prepared to occupy positions of importance and large usefulness in this or other lands. This teaching of the science of agriculture need not in any way interfere with the instruction in the art of agriculture.

There may be those who cannot see where our student body is to be derived from for this high class of work. The college will create a demand for agricultural education and for educated agriculturists. As the students of Oahu College, the High School, Kamehameha, and the other preparatory schools of the Islands become aware of the opportunities for students in agriculture, and of the fact that to acquire an agricultural education at the college, requires little in money but much in perseverance and work there will be many of the ablest among them who will seek its open doors. There are young men today in our agricultural colleges of the mainland who are looking towards the tropics as the field for their future work. They are endeavoring to study tropical agriculture with frozen soil and snow-covered fields. To get such young men in the College of Hawaii would result in bringing to this country many an enterprising young man, who would remain and who by his financial and mental resources, would do much for the development of the Territory. Many another who here gained his knowledge of tropical agriculture would in distant lands do valuable promotion work for the agriculture of Hawaii, and would doubtless send us many a settler. Since it is confidently expected, a very large part of the financial support of the college will be from the United States treasury, it is only fitting that the institution should have something of a national character.

It will be felt by some that this is too high and too large a work for a college of resources so limited as those of the College of Agriculture of Hawaii. I believe, however, that small means need not prevent this work being carried out. There is in Hawaii today a body of specialists in many branches of tropical agriculture and who are, I believe, sufficiently interested in the development of Hawaii and its agricultural re-

sources to give a limited portion of their time to lecturing in the college, uninfluenced by financial considerations. A large part of the staff could be supplied by the same method as is now in vogue in many of the strongest medical colleges wherein physicians devote a certain portion of their time to college lectures. Frequently the services of the ablest medical men could only be secured in this way. If a course of advanced lectures in forestry, rubber cultivation, soils and soil management, tropical entomology, plant pathology, and the like could be given by the specialists in these lines who are already in the Territory, the College of Agriculture of Hawaii could offer to its students a course so strong as to compare favorably with any of the colleges of the mainland in its special sphere. An occasional lecture could also be provided by some one who has made a success in the business of agriculture from a commercial standpoint. This practice is being carried out by colleges on the mainland, and has its valuable features. It draws the farmer into closer contact with the college, and the college into closer sympathy with the work of the farmer. The students gain much inspiration as well as valuable information from a talk by one who has succeeded in the growing of pineapples or some other crop.

In this way it would be possible to build up on small resources a very able college of tropical agriculture, unique in its sphere among American agricultural colleges, equal in its standard to any of them, and which would be a powerful force in the molding of the future of agricultural industries in Hawaii.

SYLLABUS OF A FOUR YEARS' COURSE IN AGRICULTURE BASED UPON THE SEVERAL REPORTS OF THE COMMITTEE ON METHODS OF TEACHING AGRICULTURE OF THE ASSOCIATION OF AMERICAN AGRICULTURAL COLLEGES AND EXPERIMENT STATIONS.¹

(Compiled by F. G. Krauss.²)

General subjects essential to a four years' course in agriculture leading to the degree of Bachelor of Science:

	Hours.
Algebra	75
Geometry	40

¹ Committee of the Association of American Agricultural Colleges and Experiment Stations. See Reports U. S. Dept. of Agri., Office of Experiment Stations, Buls. 41, p. 57; 49, p. 29; 65, p. 79; 76, p. 39, and Bul. No. 127; and Circ's. 32, 37, 39, 41, and 45.

² With slight alterations to adapt same to Hawaiian crops.

Trigonometry	40
Physics (class-room work)	75
Physics (laboratory work)	75
Chemistry (class-room work)	75
Chemistry (laboratory work)	75
English	200
Modern languages	340
Psychology	60
Ethics or logic	40
Political economy	60
General history	80
Constitutional law	50
 Total	 1285

The total number of hours included in a four-years' course, allowing fifteen hours per week for thirty-six weeks, would be 2,140; with ten hours' laboratory work, or practicums, added, 3,600. In general terms, therefore, the foregoing general studies should comprise about two-fifths of the work required for a bachelor's degree in agriculture.

The committee on methods of teaching agriculture suggests additional subjects to be included in a four-years' course in agriculture leading to the degree of bachelor of science, as follows:

	Hours.
Agriculture	486
Horticulture and forestry	180
Veterinary science, including anatomy	180
Agricultural chemistry, in addition to general requirement	180
Botany (including vegetable physiology and pathology)	180
Zoology (including entomology)	120
Physiology	180
Geology	120
Meteorology	60
Drawing	60
 Total	 1746

In reckoning the number of hours, two hours of laboratory work, or practicums, are considered the equivalent of one hour of recitation. In this way the total number of hours in a four-years' course is made 2,900, instead of 3,600.

Taking up the subject of "Agriculture" designated above, the committee recommends that agriculture (486 hours) shall include and be divided into:

	Hours.
1. Agronomy, or plant production.....	132
2. Zootechny, or animal industry.....	162
3. Agrotechny, or agricultural technology.....	72
4. Rural engineering, or farm mechanics.....	60
5. Rural economics, or farm management.....	60
	<hr/>
	486

SYNOPSIS OF COURSE IN AGRICULTURE.

Agronomy, 132 hours.—Climate, soils, tillage, drainage and irrigation; fertilizers, plant production, farm crops.

Zootechny, 162 hours.—Principles of breeding, breeds of live stock, stock, feeding, care and management. (Animal physiology to be taught under physiology; anatomy and animal diseases, under veterinary science.)

Agrotechny, 72 hours.—Butter making, cheese making. (Other topics, such as sugar making, wine, or olive oil making, may be taught under this head in different parts of the United States.)

Rural Engineering, 60 hours.—Roads, drains, irrigation systems, farm buildings, and machinery.

Rural Economics, 60 hours.—History of agriculture, farm management, rural law, farm accounts.

EQUIPMENT FOR COURSE IN AGRICULTURE.

The following brief statements may serve to show in a general way the equipment required in connection with the instruction given in a four-years' course in agriculture:

Agronomy.

Field trials of various crops for class demonstration.

Laboratory (including glass house) for work in soil physics, not experiments, etc. This laboratory should have a floor space of from 1,000 to 2,000 square feet.

Collection of soils, fertilizers, plants, etc., for class illustration.

Photographs, lantern slides, charts, diagrams.

Books of reference.

Zootechny.

Live stock of different types and breeds.

Lecture room, arranged for exhibiting live animals to class and equipped with instruments of precision for weighing and measuring.

Collections: models, mounted specimens of animals, specimens of foods, etc.

Lantern slides, photographs, charts, etc.

Reference books, especially herdbooks and stock registers.

(There should be a seminary room for the use of these books.)

Agrotechny.

Dairy laboratory (this should include the following rooms, which may cover some 6,000 feet of floor space) : Butter-making room, cheese-making room, cheese-curing room, pasteurizing room, receiving room, store room, refrigerating room, boiler and engine room. These rooms should be equipped with all modern apparatus for testing and pasteurizing milk and making butter and cheese.

Rural Engineering.

College farm should illustrate various problems in farm engineering, such as roads, drainage, and irrigation.

Laboratory, equipped with apparatus for illustrating various mechanical problems in farm machinery.

Collections: tools and farm machinery.

Lantern slides, charts, and diagrams.

Reference books.

Rural Economics.

Reference books.

BOARD OF AGRICULTURE AND FORESTRY.

REORGANIZATION OF COMMITTEES.

At the meeting of the Board of Commissioners of Agriculture and Forestry, held on April 17th, Mr. W. M. Giffard, the President of the Board made announcement that certain of the Committees of the Board had been reorganized, on account of the resignation of former members of the Board and the appointment of new men. The list of Committees as they now stand is as follows:

Forestry—Messrs. A. W. Carter, W. M. Giffard and P. R. Isenberg.

Entomology—Messrs. W. M. Giffard and G. P. Wilder.

Finance—Messrs. C. S. Holloway and W. M. Giffard.

Rules and Regulations—Messrs. A. W. Carter and C. S. Holloway.

Agriculture—Messrs. G. P. Wilder, L. G. Kellogg and P. R. Isenberg.

Animal Industry—Messrs. A. W. Carter, P. R. Isenberg and L. G. Kellogg.

PRESIDENT PRO TEMPORE.

To insure that the Board of Agriculture and Forestry shall never be left without an Executive Officer, the Governor has ruled that on leaving the Territory the person holding the office must resign. Accordingly, during the absence of Mr. W. M. Giffard on a three months' trip to the mainland, Mr. C. S. Holloway has been appointed as President and Executive Officer. Mr. Holloway's appointment took effect on the day of Mr. Giffard's departure, May 22, 1907.

DIVISION OF FORESTRY.**ROUTINE REPORTS.**

April 17, 1907.

Board of Commissioners of Agriculture & Forestry, Honolulu.

Gentlemen:—I have the honor to submit the following report, covering the routine work of the Division of Forestry, from April 3rd to date.

During the fortnight, I have been continuously in Honolulu engaged with the routine work of the Division and with the preparation of two reports on forest reserve projects. These will be submitted to the Committee on Forestry within a few days.

Since my last report Mr. Haugs has completed the planting plan for the Catholic Mission lands in Kalihi valley. A copy of the plan has been handed to Father Adelbert Rielander.

An application for a forest planting plan has been received from the Wahiawa Water Company. Mr. Haugs will visit Wahiawa this week to make the necessary examination on the ground.

Mr. Haugs has also made several trips up Nuuanu Valley to oversee certain work in transplanting trees and shrubs on the Atherton property made necessary by the construction of a new pipe from the Nuuanu dam.

I regret to report that House Bill No. 177, an Act introduced by Hon. Wm. J. Sheldon, to provide for the better protection of forest trees against trespass, was killed in the House.

A limited number of Farmers' Bulletins consisting of a series of about a dozen numbers has been received from the Delegate to Congress, and distributed to the principals of the larger public schools. There yet remains on hand some of

the congressional vegetable seed. This may be had upon application to the Mailing Clerk.

The library room of the Board was used for meetings during the past fortnight, as follows:

Hawaiian Entomological Society, April 4th.

Hawaiian Poultry Association, April 9th.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

April 30, 1907.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—I have the honor to submit the following report covering the work of the Division of Forestry from April 17 to date.

During this fortnight I have been in Honolulu occupied with the completion of reports on a proposed forest reserve on the Island of Kauai and on the addition of certain government lands to the "area actually reserved" in the Koolau (Maui) and the Hana Forest Reserves. The remainder of the time has been taken up with attention to various details connected with the regular work of the Division.

On Thursday, April 18th, Mr. Haugs visited Wahiawa and completed the field work necessary for the preparation of a planting plan for the Wahiawa Water Company.

A collection of exotic seed has recently been sent out to thirteen volunteer observers who have consented to plant the seed and later set out the trees.

On Tuesday, April 23, Mr. Haugs moved into the cottage in the nursery grounds which has recently been put into repair. This will enable him to exercise continuous supervision over the grounds, a care which since Mr. Austin's resignation has not been exercised.

The library room of the Board was used for a meeting of the Honolulu Improvement Advisory Board on Tuesday, April 23.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

Report of the Forest Nurseryman.

In a report to the Superintendent of Forestry dated April 30, Mr. David Haugs, the Forest Nurseryman, after mentioning his trip to Wahiawa, says:

"An order has been received from Mr. C. A. Brown, manager of the Ii Estate, for ten thousand trees to be planted on a tract of land examined by the writer on November 28th, 1906. The trees are to be ready by September and planted according to recommendations made at the time of examination.

Collection and Distribution of Seeds.

"The collecting of seed for sale and exchange purposes has been continued and a large variety of seed is now in stock.

"Packages of tree and other seeds are arriving by every mail, from those who have received seed from us.

"Exotic seed has been distributed locally as follows:

"W. D. McBryde Esq., Rev. Hans Isenberg, G. N. Wilcox, Kauai.

"L. von Tempsky, Esq., H. A. Baldwin, Esq., Maui.

"James Munro, Esq., Molokai Ranch, Molokai.

"A. W. Carter, Esq., Parker Ranch, R. von L. Domkowicz, Esq., W. H. Shipman, Esq., D. Forbes, Esq., Robert Horner, Esq., Julian Monsarrat, Esq., Hawaii.

"John Herd, Esq., Oahu.

"Each of the above received one package each of the following:

- 1 pkt. *Pinus Ponderosa*,
- 1 pkt. *Pinus Canariensis*,
- 1 pkt. *Pinus Attenuata*,
- 1 pkt. *Pinus Coulteri*,
- 1 pkt. *Pinus Lambertiana*,
- 1 pkt. *Pinus Jeffreyi*,
- 1 pkt. *Sophora japonica*."

DIVISION OF ENTOMOLOGY.

REPORT ON HORTICULTURAL-QUARANTINE INSPECTION WORK.

Honolulu, T. H., April 17th, 1907.

To the Honorable Board of
Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—During the past two weeks we have visited fourteen steam and sailing vessels that have arrived in port from

outside the Territory, on which we found 5,643 packages of fruits and vegetables and 8 cases and bales of trees and plants. Half of the latter were intended for other Islands, but were inspected and treated here.

Four hundred crates of potatoes—the first that have arrived from Australia since my residence here—were found to be seri-

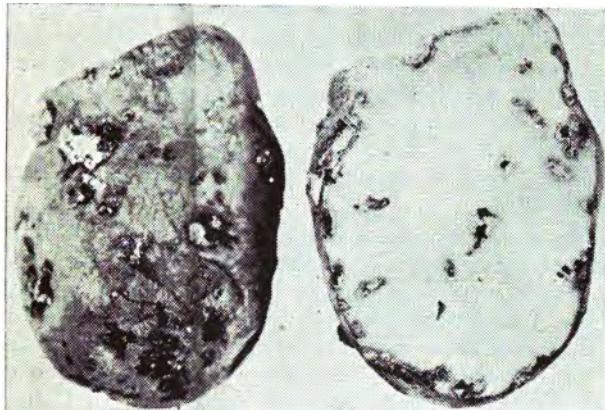


FIG. 10—Australian potatoes infested with caterpillars of potato moth (*Lita solanella*).

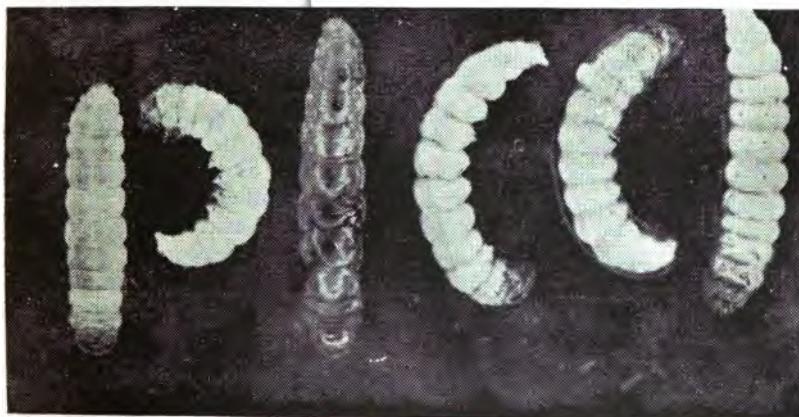


FIG. 11—Caterpillars of potato moth, enlarged about 5 times. Original.

ously infested with the caterpillars of the "potato moth" (*Lita solanella*). The crates with the potatoes were ordered back upon the steamer and the Captain was instructed to see that all were dropped overboard when the ship was one day from port. A sworn affidavit, attested to by the Captain, First Officer and Purser to be delivered to me by return. The potatoes were so seriously infected that not a single one could be found without one or more worms and some were so badly attacked that not an inch of sound tuber was left. The caterpillars appear to select or prefer the depression around the eye of the potato to spin their cocoons. Mr. Kotinsky has photographed a few of the caterpillars and their work; these photographs will give you a clearer idea of the destructiveness of the pest. We are not aware that this moth will attack the sweet potato or yams, but from its scientific name would conclude that it confines its attack to ordinary potatoes.

Garlic has heretofore been found free from insects, but on the same steamer from Australia as the infested potatoes arrived, six cases of garlic were landed here by mistake and my assistant, Mr. Jordan, found them attacked by a small brown beetle, so he ordered the cases to be immediately placed on board again and I advised the inspector—Mr. Ehrhorn—at San Francisco of their condition, for if the beetle becomes established in California it would be liable to reach us from there.

On the S. S. "Hilonian" that arrived from San Francisco on the 12th inst, amongst her freight we found seventy boxes of scale infested apples that we had reshipped to California on the S. S. "Sierra," sailing the same evening for San Francisco.

On the S. S. "Korea" Mr. R. H. Sawyer, representing the Department of Agriculture, Washington, D. C., returned from Japan where he had been sent by Secretary Wilson to secure the best variety of "rush" (*Juncus*) for the manufacture of the very best matting. Mr. Sawyer succeeded in accomplishing his mission with the assistance of a number of guards to see that the plants were not confiscated by the Japanese, as they strongly object to any of such plants being exported to other countries. The *Juncus* were carefully fumigated, as the four baskets were for experimental culture here on the Islands.

In the packages received by mail was one containing acorns attacked by weevil beetles that we confiscated. Thirty-four packages of plants and seed arrived by mail and were carefully examined.

Respectfully submitted,

ALEXANDER CRAW,
Superintendent of Entomology and Inspector.

DIVISION OF FORESTRY.

ADDITIONS TO THE KOOLAU AND HANA FOREST RESERVES—MAUI.

Acting under the provisions of Act No. 4 of the Session Laws of 1907, the Superintendent of Forestry brought before the Board of Agriculture and Forestry at the meeting held on April 30, 1907, a recommendation to increase the area of government land actually set apart in the forest reserves established in the districts of Koolau and Hana, Island of Maui. Under the old law these lands were included within the reserves but were not subject to the control of the Board in any way. By the proposed action they will be set apart as integral portions of the two reserves. During the period of existing leases all the rights acquired thereunder will continue to be exercised by the lessees, but upon the expiration of the leases, the lands will automatically come into the fully reserved class. The area of the lands to be so set apart in the Koolau Forest Reserve is 15,930 acres; in the Hana Forest Reserve, 7,013 acres.

The advantage of this new law is that it enables adjoining owners and other persons interested to know definitely what the Government's policy will be in regard to certain forest lands when the existing leases run out. In the Koolau Reserve the reservation of these lands fulfills the Government's obligation under the agreement entered into last autumn with the plantations controlled by the Alexander & Baldwin interests.

As usual with forest reserve projects, the report of the Superintendent of Forestry and the resolutions adopted by the Board are published herewith.

RESOLUTION RELATING TO THE KOOLAU (MAUI) FOREST RESERVE.

RESOLVED, That those certain lands in the District of Koolau, Island of Maui, described in general terms as follows: Those portions of the government lands of Honomanu; Keanae, Mauka; Wailua, 1 and 2 Mauka; Wailua-Ulaino Forest, two tracts; within the boundary of the Koolau Forest Reserve and containing an area of 15,930 acres, more or less, as recommended in a report of the Committee on Forestry, made on April 30, 1907, based on report of the Superintendent of Forestry, dated April 23, 1907, which reports are on file in the office of the Board of Agriculture and Forestry; the boundaries of which proposed reservation more particularly appear

by and on a map made by the Hawaiian Government Survey Department, which said map is now on file in the said Survey Department, marked "Registered Map No. 1268," and "Koolau (Maui) Forest Reserve;" and a description accompanying the same numbered C. S. F. 1630, which said description is now on file in the said Survey Department; copies of which said map and description are now on file in the office of this Board and made a part hereof; be approved as portions of the Koolau (Maui) Forest Reserve.

RESOLVED, That the Board recommends to the Governor that the government lands lying within the boundaries of the said Koolau (Maui) Forest Reserve be set apart by him, subject to vested rights therein, after the hearing required by law, as portions of the Koolau Forest Reserve.

Adopted at a meeting of the Board of Agriculture and Forestry, held on April 30, 1907.

RESOLUTION RELATING TO THE HANA FOREST RESERVE.

RESOLVED, That those certain lands in the District of Hana, Island of Maui, described in general terms as follows:

Those portions of the government lands of Koali-Puuhaao, Wakiu, Kawela-Kaeleku, East Honomaele, and the Hana Forest Tract, within the boundary of the Hana Forest Reserve and containing an area of 7,013 acres, more or less, as recommended in a report of the Committee on Forestry, made on April 30, 1907, based on report of the Superintendent of Forestry, dated April 23rd, 1907, which reports are on file in the office of the Board of Agriculture and Forestry; the boundaries of which proposed reservation more particularly appear by and on maps made by the Hawaiian Government Survey Department, marked "Registered Maps No. 1268 and 1750," and "Hana Forest Reserve, Maui;" and a description accompanying the same, numbered C. S. F. 1690, which said description is now on file in the said Survey Department; copies of which said maps and description are now on file in the office of this Board and made a part hereof; be approved as a portion of the Hana Forest Reserve.

RESOLVED, That the Board recommends to the Governor that the government lands lying within the boundaries of the said Hana Forest Reserve be set apart by him, subject to vested rights therein, after the hearing required by law, as portions of the Hana Forest Reserve.

Adopted at a meeting of the Board of Agriculture and Forestry held on April 30, 1907.

REPORT OF THE COMMITTEE ON FORESTRY.

At the meeting of the Board held on April 30th, 1907, Mr. A. W. Carter, Chairman of the Committee on Forestry, verbally reported that the Committee approved the recommendations contained in Mr. Hosmer's report on a proposed change of status in certain of the lands in the Koolau and Hana Forest Reserves on Maui, and recommended to the Board that the matter be brought to the Governor's attention in the usual way.

By vote of the Board, this report was approved and adopted.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

Honolulu, April 23, 1907.

Committee on Forestry, Board of Commissioners of Agriculture and Forestry, Honolulu.

Gentlemen:—Act No. 4 of the Session Laws of 1907 amends Chapter 28 of the Revised Laws of Hawaii, by empowering the Governor to set apart government land as forest reserves, whether it is under lease or not, provided that if the land is under lease, the reservation shall not affect the vested rights thereby acquired. Under the terms of this act I hereby recommend the reservation as "lands actually set apart" of the tracts of government land now under lease, within the boundaries of the Koolau and the Hana Forest Reserves on Maui.

The reasons for the creation of the forest reserves on the windward side of Maui were fully discussed by me in former reports. The arguments there set forth apply with equal force to the lands now under consideration, which form integral parts of the two reserves as established. They need not be repeated here.

For purposes of reference it may be stated that my report upon the Koolau Forest Reserve was made under the date of July 28, 1905, published in the Forester and Agriculturist for August, Vol. II, pp. 234-240. Reports on the Hana Reserve were made on March 2 and April 6, 1906, published in the Forester and Agriculturist for November, 1906, Vol. III, pp. 353-358. The Koolau Forest Reserve proclamation appeared in the Forester for September, 1905, Vol. II, pp. 272-273; that of the Hana Reserve in the issue for December 1906, Vol. III, pp. 418-419.

In connection with the setting apart of the lands in the Koolau Reserve it should be borne in mind that in the agreement entered into last autumn between the Government and the Alexander & Baldwin plantations, whereby the manage-

ment of the private land in the Koolau Reserve was turned over to the Board, the Government bound itself:

"That all lands now held and owned by said Territory of Hawaii and that it may hereafter acquire during said period of this surrender, upon such acquisition, within said boundaries hereinbefore specifically set forth, *except* the lands within said boundaries covered by Government leases Nos. 538 and 539, both dated February 26, 1902, made by the Commissioner of Public Lands for and on behalf of the Territory of Hawaii to H. P. Baldwin, shall likewise be immediately set apart as a forest reserve for said purposes, as far as and as soon as it is able so to do under the laws of said Territory.

"That at least immediately upon the relief or release within said period of this surrender of all, or any part, of the lands covered by said Government Leases Nos. 538 and 539, from said leases, or either of them by expiration or termination or otherwise the lands within said boundaries so relieved or released shall be set apart as a forest reserve for said purposes; *but*, if possible under the laws of said Territory at any time within said period of this surrender before such relief, release or releases, then as soon as thus possible, the lands within said boundaries covered by said leases shall be set apart as a forest reserve for said purposes.

"That all lands set apart as hereinbefore specified as a forest reserve and all lands now held, controlled or owned by said Territory of Hawaii, within said boundaries that have already been set apart as a forest reserve for said purposes, shall be used and maintained during said period of seventeen years covered by this surrender as a forest reserve for forestry purposes according to the general purposes of the present forestry laws of the Territory of Hawaii, except where such use and maintenance will be inconsistent with the rights now existing of third persons in any of said lands, in which cases upon the termination of any such right or rights, such use and maintenance shall immediately be in the lands relieved therefrom and shall thereafter continue throughout said period of seventeen years covered by this surrender."

Under the law as it stood before the amendment enacted last month, only the land of Honomanu, 2,000 acres, in the Koolau Reserve and the small portions of E. Honomalele and the Kawela-Kaeleku tract, 80 acres, in the Hana Reserve could be set apart. The advantage of the amendment is at once apparent when in these two reserves alone it permits 22,943 acres to be put into the permanently reserved class.

That there may be no misunderstanding of the terms of the present law I may again remark that the reservation goes into full effect only on the expiration of the existing leases, all

rights acquired thereunder being guaranteed to the lessee during the term of the lease.

For the reasons above set forth I now recommend that the Board requests the Governor, to set apart, after the hearing required by law, the portions of the following named government tracts within the boundaries of the Koolau and Hana Forest Reserves as integral parts of those reserves.

Following is a list of the lands to be so set apart:

KOOLAU FOREST RESERVE.

Honomanu, 2,000 acres; Lease No. 52; Expires July 1, 1908.
 Keanae, Mauka, 8,750 acres; Lease No. 539; Ex. Feb. 26, 1923.
 Wailua, 1 and 2, Mauka, 1,280 acres; Lease No. 539, Expires Feb. 26, 1923.
 Wailua-Ulaino Forest, 3,000 acres; Lease No. 538; Expires Feb. 26, 1923.
 Wailua-Ulaino Forest, 900 acres; Lease No. 492; Expires May 1, 1917.
 Total—15,930 acres.

The first three lands were "crown lands."

HANA FOREST RESERVE.

Hana Forest, 6,330 acres; Lease No. 492; Expires May 1, 1917.
 E. Honomalele, 15 acres, Kawela-Kaeleku, 65 acres; Lease No. 474; Expires Aug. 17, 1908.
 Wakiu, 3 acres; Lease No. 518; Expires May 2, 1920.
 Koali-Puuhaaoa, 600 acres; Lease No. 479B; Expires Dec. 5, 1913.
 Total—7,013 acres.
 Total area in Koolau and Hana Forest Reserves—22,943 Acres.

Very respectfully,

RALPH S. HOSMER,
 Superintendent of Forestry.

*BOARD OF AGRICULTURE AND FORESTRY.***DIVISION OF FORESTRY.****NA PALI-KONA FOREST RESERVE—KAUAI.**

At a meeting of the Board of Agriculture and Forestry, held on April 30th, 1907, the project to create a forest reserve on the high plateau on the leeward side of Kauai, known as the Waimea Upland was approved. The proposed Na Pali-Kona Forest Reserve contains a total area of 60,040 acres, of which 40,650 acres is government land. The major part of the government land (36,670 acres) is held under several leases, each of which has some years yet to run. But under the provisions of Act No. 4 of the recently enacted Session Laws of 1907 this area can be set apart at once as a portion of the reserve, subject to the rights existing under the leases. The remainder of the government land (3980 acres) is unleased and can be fully reserved immediately.

In accordance with the usual custom there are published herewith the report of the Superintendent of Forestry upon this proposed reserve and the resolution adopted by the Board in regard thereto.

RESOLUTION RELATING TO THE PROPOSED NA PALI-KONA FOREST RESERVE.

RESOLVED, That those certain lands in the Districts of Na Pali and Kona, Island of Kauai, bounded in general terms as follows:

Lying on the Waimea Upland, bounded on the South and West by a line drawn across the ahupuaas of Hanapepe, Makaweli and Waimea, between points on the main ridges where the general level of the upland breaks into the steep palis of the canyons; on the Northwest by the palis of Na Pali District; on the North and East by the Districts of Haleleia and Puna; and on the Southeast by the land of Wahiawa, and containing an area of 60,040 acres, more or less, as recommended by the Committee on Forestry on April 30, 1907, based on a report of the Superintendent of Forestry dated April 22, 1907, which report is on file in the office of the Board of Agriculture and Forestry; the boundaries of which proposed reservation more particularly appear by and on maps made by the Hawaiian Government Survey Department, which said maps are now on file in the said Survey Department, marked "Registered Map Nos. 2246 and 2375," and "Na Pali-Kona Forest Reserve, Kauai;" and a description accompanying the same, numbered C. S. F. 1757, which said de-

scription is now on file in the said Survey Department; copies of which said maps and description are now on file in the office of this Board and made a part hereof; be approved as a forest reserve to be called the Na Pali-Kona Forest Reserve.

RESOLVED, That the Board recommends to the Governor that the Government lands lying within the boundaries of the said proposed Na Pali-Kona Forest Reserve be set apart by him, subject to vested rights therein, after the hearing required by law, as the Na Pali-Kona Forest Reserve.

Adopted at a meeting of the Board of Agriculture and Forestry, held on April 30, 1907.

REPORT OF THE COMMITTEE ON FORESTRY.

Honolulu, April 22, 1907,

At the meeting of the Board held on April 30, 1907, Mr. A. W. Carter, Chairman of the Committee on Forestry verbally reported that in the judgment of the Committee the property mentioned in the report of the Forester should definitely and for all time be set apart as a forest reserve. It is essentially forest land and is of greater value for a forest reserve than for anything else. The land cannot advantageously be utilized for any other purpose. The bulk of the property is at a very high elevation and includes many gulches and ridges. A large portion of the area is now very heavily wooded. This property has a tremendous value as a source of water supply to the adjacent agricultural lands.

On behalf of the Committee Mr. Carter recommended that the report of the Forester be adopted and that the usual request be made to the Governor as regards a public hearing.

It being duly moved and seconded, the Board voted to adopt the report of the Committee on Forestry and to request the Governor to take the action desired.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

Honolulu, April 22, 1907.

Committee on Forestry, Board of Commissioners of Agriculture and Forestry, Honolulu.

Gentlemen:—I have the honor to submit the following report, with recommendations, upon the project to create a forest reserve in the Districts of Na Pali and Kona on the Island of Kauai. The report is based on a personal examination of the locality made by me during the summer of 1906, supplemented by information obtained during previous visits to Kauai and in other ways.

LOCATION.

The section proposed to be reserved is the high table land embracing the upper part of Na Pali and Kona Districts. The area is roughly rectangular in shape, some fifteen miles long by some six miles wide, with the major axis running N. W. and S. E. The tract may be described in general terms as that portion of the Waimea Upland, embracing the mauka portion of the Districts of Na Pali and Kona, Island of Kauai, which is bounded on the South and West by a line drawn across the ahupuaas of Hanapepe, Makaweli and Waimea, between points on the main ridges where the general level of the upland breaks into the steep palis of the canyons; on the Northwest by the palis of Na Pali District; on the North and East by the Districts of Halelea and Puna; and on the Southeast by the land of Wahiawa. The area included within the boundary thus described is given by the Survey Office as 60,040 acres.

OBJECT.

The purpose in setting apart this section as a forest reserve is essentially that of forest protection. In the area within the boundary above outlined are a number of streams of great potential value for the development of power and for irrigation. The object of the proposed Na Pali-Kona Forest Reserve is permanently to protect the forest on the catchment basins and at the headwaters of these streams against injury of all kinds, that the forest cover may be kept intact and permitted to exert its influence on equalizing and maintaining the flow, as well as by helping to prevent erosion. This last feature is important because it is very desirable that as little material as possible be carried down stream in time of flood, to be deposited on the arable lowlands and also because clear water is an item well worth considering where a stream is to be harnessed to drive power wheels.

Another benefit to be obtained from his reserve is the influence on precipitation that under certain meteorological conditions is unquestionably exerted by a body of forest of the size, and so situated as is that on the Waimea upland. The laws that control the relation of forest and rainfall are not yet understood but the result of their action is sufficiently tangible, in these islands at any rate, to justify their being reckoned with.

DESCRIPTION.

The proposed Na Pali-Kona Forest Reserve is made up of a few large lands which are at present controlled by a few persons only. The following table gives the names of the several tracts with the area and other information in regard to each. It is based on data furnished by the Survey Office:

NA PALI DISTRICT.

Na Pali, 130 acres; leased to W. E. H. Deverill; Lease No. 345; Expires July 1, 1913.
 Na Pali, 6360 acres; leased to W. Kinney; Lease No. 453; Expires July 7, 1917.
 Na Pali, 3980 acres government land, unleased.
 Total—10,470 acres.

KONA DISTRICT.

Waimea, 5808 acres; leased to Knudsen Estate; Lease No. 164; Expires June 1, 1920.
 Waimea, 3110 acres; leased to Gay & Robinson and transferred to Knudsen Bros.; Lease No. 112; Expires Dec. 27, 1917.
 Waimea, 21,262 acres; leased to Gay & Robinson; Lease No. 112; Expires Dec. 27, 1917.
 Makaweli, 10,030 acres; owned by Gay & Robinson, fee simple.
 Koula and Manuahi, 9360 acres; owned by Gay & Robinson, fee simple.
 Total—49,570 acres. (Area government land, 30,180 acres.)
 Total area in Na Pali and Kona Districts—60,040 acres.

TOPOGRAPHY.

The Waimea Upland is a high plateau very much broken by branching, deep-cut canyons. The average elevation of the summits of the ridges is between 3000 and 4000 feet, the land sloping back gradually to the high ridges in the center of the island that make its back bone.

The upland is divided into three watersheds, the drainage areas of (1) the Hanapepe River, (2) the Waimea River and (3) the various streams that empty directly into the ocean in the Na Pali District. In all essential characteristics the topography of these three systems is of the same order, save that in the canyons of the East and West forks of the Waimea River, the process of degradation has gone further, with the result that larger canyons have been formed, with a greater number of lateral branches.

In the Waimea watershed erosion has gone on so far in the main canyons that the floors of the valleys are cut down to within a few hundred feet of sea level. From the narrow stream bed the canyon walls rise precipitately, in many cases for several hundred feet sheer, while for the remainder of the two thousand or more feet to the top of the canyon, the palis are hardly less steep.

From each of the lateral valleys streams of varying size drop in cascades into the main canyon, bringing motion into

the picture and adding another hue to the bright colors of certain of the outcropping strata.

These features, with the depth of the canyons and the bold sculpturing of the sharply cut dividing ridges into pinnacles and castledated outposts, make the section one of great scenic interest. Indeed in a reckoning of the natural beauties of the Hawaiian Islands the canyons of Kauai, and particularly those of the Waimea and Makaweli Rivers, are to be listed near the top.

The Hanapepe Valley is perhaps not less wonderful than its neighbors to the westward but its beauty is of a different order from that of the great cleft in the island that has been cut by the waters of the Waimea.

In each of the larger valleys at an elevation of about 3000 feet there outcrops a hard stratum that marks the top of all the principal waterfalls. This impervious layer seems to be continuous over a considerable area as it appears in both the Na Pali and the Waimea Districts. It is of more than passing interest because of the part that the waterfalls it controls may some time play in a program of power development.

All the larger tributary canyons carry streams that during the rainy season contain considerable bodies of water. So far as I could learn no systematic measurements had ever been made of the water in these upper streams.

At present water is diverted for irrigation at waterheads in the Hanapepe, Olokele and Waimea Rivers, the last named stream now being tapped in two places, while a third ditch is in process of construction. The water goes to irrigate the cane fields on the neighboring sugar plantations. So far no power has been developed on any of the streams in this section. It is understood, however, that with the completion of the Kekaha Plantation ditch, the ditch that taps the Waimea stream highest up, power is to be developed by dropping the water at two points.

On the plateau is much swampy land, especially in the depressions at the heads of the larger gulches. Here the bottom is at times so soft as to make thorough exploration difficult, if not hazardous; a condition that is, however, admirably adapted for water conservation.

THE FOREST.

With the exception of the steep walls of the canyons practically all of the area within the proposed reserve is covered with forest, which protects the swampy ground-cover and makes the section particularly well adapted to absorb and retain the rain water.

A notable feature of the forest on the Waimea, upland is the large number of fine specimens of a considerable variety of forest trees not commonly found in the Hawaiian forests.

Ohia lehua (*Metrosideros polymorpha*) predominates among the trees in mixture. Other important tree species are Koa, (*Acacia koa*), Koolea (*Myrsine lessertiana*), Kopiko (*Straussia*), Ohia ha (*Eugenia sandwicensis*), Iliahi or Sandalwood (*Santalum freycinetianum*), and Kauwila (*Alphitonia ponderosa*).

Among a goodly number of small trees and high shrubs special mention may be made of the Lobelia a characteristic and very noticeable plant in the forest at this elevation, where it reaches its best development.

To both the forester and the botanist the forest on the Waimea Upland is one of the most interesting regions in the Territory, for it is full of problems, the solution of which presents attractive rewards to the scientific investigator.

ENEMIES OF THE FOREST.

Wild Cattle.

In former years cattle grazing was carried on both on the private land of Makaweli and the government land of Waimea. Although this use of the land has now been discontinued for some years there still remain in the forest bands of wild cattle. On the portion of Waimea to the west of the Waimea-Poomau canyon systematic extermination of the wild cattle in the woods was begun by the Knudsen Estate over twenty years ago and continued until the wild cattle were practically all got out or killed. Since 1898 a forest fence, built and maintained by the firm of Knudsen Brothers, has prevented the Knudsen ranch cattle from getting into the forest, which has been treated by the lessees as a private forest reserve.

On Makaweli the extermination of the wild cattle was begun later but for the last few years has been very vigorously carried on by Messrs. Gay & Robinson, with the result that the bands of wild cattle are greatly reduced in number. Under the direction of Mr. Gay a comprehensive system of trails has been constructed that greatly facilitates the hunting of the wild cattle. It is the intention of Messrs. Gay and Robinson to continue this work until the wild cattle are exterminated.

As all ranch stock is kept at the lower levels, the forest within the reserve boundary may properly be regarded as a private forest reserve. It is the intention of Messrs. Gay and Robinson that it be kept so.

Goats.

The other principal source of injury to the forest in the reserve is from the wild goats. These animals live on the cliffs and are found in each of the large valleys both in the

Kona and Na Pali Districts. The goats are doing much damage by destroying the scanty vegetation on the steep canyon sides and exposed ridges, thus allowing erosion to go on more rapidly, with the result that more debris falls into the valleys and that the side gulches work back faster into the upland. At different times in the past there have been goat hunts and as occasion now offers a few goats are killed but as it is now carried on this work does little toward checking the increase of this pest. Systematic and continued hunting by well trained mountaineers seems to be the only effective way of getting rid of the goats. It is hoped that later, work of this sort can be undertaken as a part of the administration of the reserve.

Fire.

The Waimea Upland has been remarkably free from forest fires. On the Gay and Robinson lands this is doubtless due in large part to the policy of that firm in fining the person who lets the fire start, the fine so collected going into a fund out of which every one who helps put out the fire is liberally paid. It thus becomes an object to respond promptly when the alarm comes. Consequently few fires spread over any considerable area. A system of this sort can of course be made effective only where all the people of a given section are in the employ of a single interest.

PRIVATE RESERVES.

The action of the Knudsen Brothers and Messrs. Gay and Robinson in protecting the forest from fire, in getting out the wild cattle and in keeping their ranch stock outside the boundaries of the forest has resulted in fact, though not in name, that the area now proposed to be officially set apart has for some years been a private forest reserve.

The creation of the Na Pali-Kona Forest Reserve will officially recognize the reservation and give permanence, on the government land, to an arrangement that less far sighted lessees might not see fit to continue. The control of the government land during the term of the existing leases and of course that of the fee simple property vests in the present lessees or owners, unless some agreement as to forest management is voluntarily entered into with the Government. It is the intention of both the firms named to continue to manage the forest lands under their ownership or control as they have been doing in the past few years. This puts the matter on a satisfactory basis and is a program that at this time the Government is not prepared to improve on.

THE RESERVE BOUNDARY.

In fixing the limits of the Na Pali-Kona Forest Reserve, advantage has been taken as far as possible of natural boundaries. On the north and east sides it follows the district lines along the main dividing ridge of the island, the proposed reserve joining the head of that in the Halelea district. On the northwest in Na Pali District the line adopted follows the impossible cliff, leaving outside the reserve all the arable land in each of the valleys and on the flats, where there are any, along the connecting trail.

From the Kauhao cliffs to Puuhinahina, on the edge of the great Waimea canyon, an arbitrary line was chosen, principally because in about the location where the line was desired there existed a securely built fence that had since 1898 been maintained by the Knudsen Brothers as the lower boundary of the forest, above which fence cattle had not been allowed to go.

Across the canyon section the line is carried from one prominent point to another—as it also is across the private lands of Makaweli and Hanapepe. This section is for the most part naturally protected and where the upper levels are accessible to cattle a few short stretches of fence across narrow ridges would completely isolate the area above the line.

In the section east of the Waimea canyon below the forest line the flats on the lower ridges are sufficiently large to be valuable as grazing land. These ridges have long been without forest and are now covered by a dense stand of lantana, the spread of which has now been checked by its insect enemies. Were the lantana got out the area might well be stocked again with useful grasses and become good grazing land. Because of the limited amount of pasture on Kauai it is important that areas which legitimately can be put to this use be not interfered with. The lack of water and the difficulty of irrigation make it doubtful if these detached flats could be used advantageously for more intensive forms of agriculture. Across the private lands of Makaweli and Hanapepe the location of the line was discussed with, and meets the approval of the owners, Messrs. Gay and Robinson.

The only points that now remain to be considered are a few small open flats within the reserve and one or two little park-like valleys on the western side of the Waimea canyon. In one of these valleys, at a place called Halemanu, is a mountain camp maintained by the Knudsens, and nearby is another built by Mr. Faye, manager of the Kekaha Plantation. In my judgment the best use to which such areas can be put is as sites for recreation camps and mountain houses. And I believe that with proper restrictions and limited, non-transferable leases, these areas can be so used without detriment to the

objects of the reserve and to better advantage than in any other way. The areas of open land are at too high an elevation, too restricted in size and too far distant from the coast to have other value than for some such purpose.

The only agricultural land in the canyons inside of the forest line is found in the Koae gulch, a branch of the Waimea canyon. This area, which could be used for grazing, has been excluded, by description, from the Reserve. The area is 530 acres.

RECOMMENDATION.

On the basis of the facts herein set forth I now recommend that the Board requests the Governor to create as the Na Pali-Kona Forest Reserve the area within the boundary hereinafter technically described and to set apart as portions thereof, after the hearing required by law, the unleased portions of the government land in the District of Na Pali (to be set apart definitely and at once) and the leased portions of the government lands of Na Pali and Waimea (to be set apart under the provisions of Chapter 28 of the Revised Laws, as amended by Act No. 4 of the Session Laws of 1907), within the boundary of the Na Pali-Kona Forest Reserve.

DESCRIPTION.

[Here follows in the original a technical description of the Reserve boundary, prepared by the Survey Department. It is here omitted as it also forms a part of the official proclamation, to be published in full in a later issue.]

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

BY AUTHORITY.

Notice is hereby given that C. S. Holloway, Esq., has been appointed President of the Board of Agriculture and Forestry, vice W. M. Giffard, resigned.

A. L. C. ATKINSON,
Secretary of Hawaii.

Executive Building, Honolulu, May 21, 1907.

DIVISION OF ANIMAL INDUSTRY.

Rule 4.—To amend Rule 1 of the Division of Animal Industry governing the inspection and testing of imported live stock.

It having been found impracticable, for want of competent inspectors, to have horse stock (including mules and asses) and cattle submitted to respectively the mallein and the tuberculin tests at any other port than Honolulu, it is ordered that paragraph 4 of Rule 1 of the Division of Animal Industry of this Board be and is hereby amended to read as follows:

"Until further notice the port of Honolulu shall constitute the only port for horse stock and cattle, unless the same shall be accompanied by certificates of mallein or tuberculin tests as provided for in Rule 2 of the Division of Animal Industry of this Board."

Any violation of this rule is a misdemeanor.

This regulation shall take effect at once.

W. M. GIFFARD,
President and Executive Officer,
Board of Agriculture and Forestry.

Approved May 2, 1907.

G. R. CARTER,
Governor of Hawaii.

ACT 112.

AN ACT

TO AMEND SECTION 390 OF THE REVISED LAWS OF HAWAII.

Be it Enacted by the Legislature of the Territory of Hawaii:

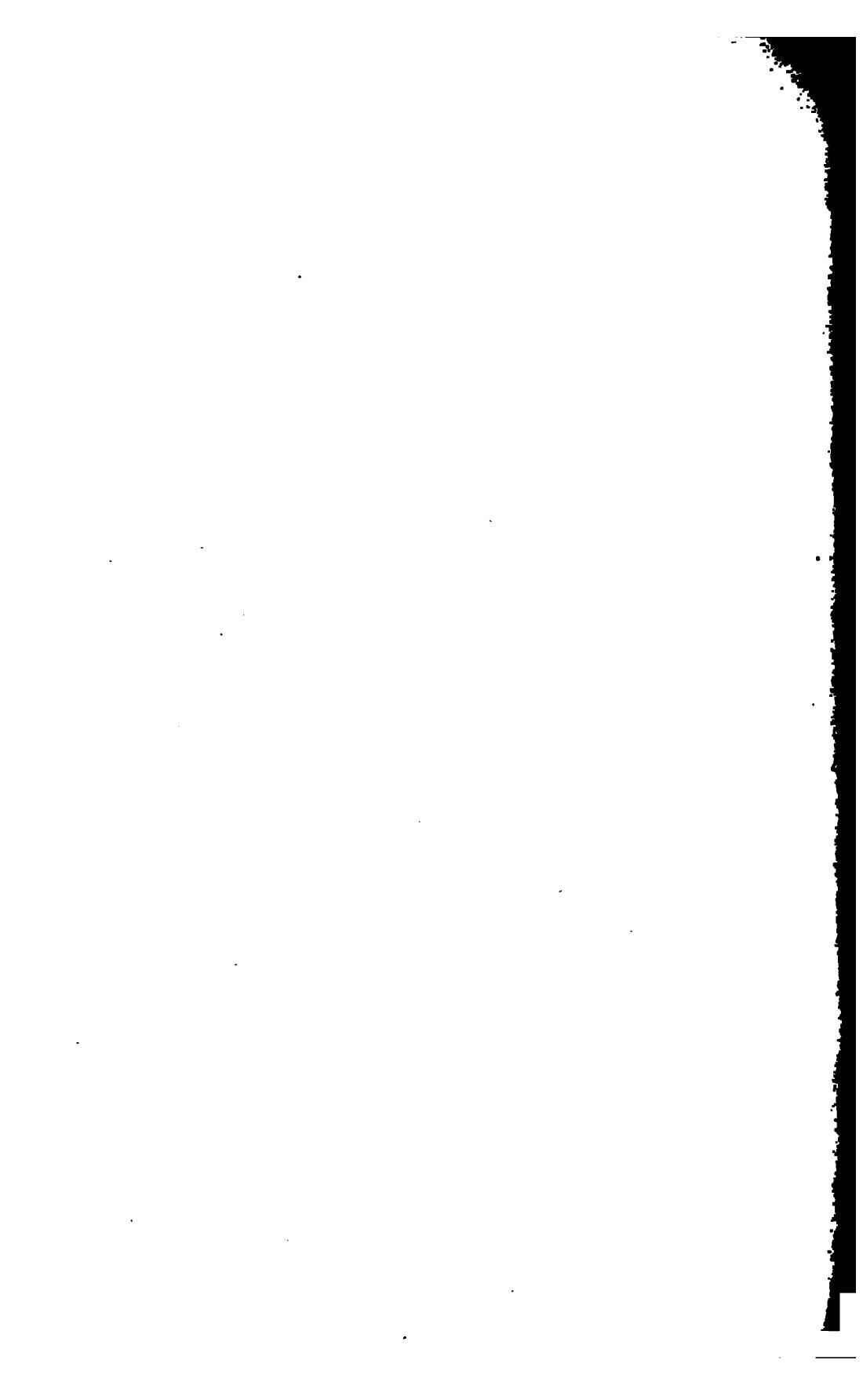
Section 1. That Section 390 of the Revised Laws of Hawaii be and the same is hereby amended to read as follows:

"Section 390. Penalty for Violations. Any person violating any of the provisions of this Chapter, or any rule or regulation of the Board of Commissioners of Agriculture and Forestry, and any master of any vessel which shall bring into this Territory any article which the Board shall at any time prohibit from being imported into this Territory; and the master of any vessel from which shall be landed any article in this Chapter required to be inspected, until he shall have received a permit to land the said articles from the Board or its officer or inspector, as in this Chapter provided, shall be guilty of a misdemeanor and shall be punished by a fine not to exceed five hundred dollars.

Section 2. This Act shall take effect from and after the date of its approval.

Approved this 30th day of April, A. D. 1907.

G. R. CARTER,
Governor of the Territory of Hawaii.



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NOTICE FROM THE DIVISION OF ENTOMOLOGY

The Entomological Division of this Board wishes to inform Hawaiian readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER & AGRICULTURIST

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No. 7

MENDEL'S LAW OF BREEDING.

An Address Before the Hawaiian Poultry Association, by
Philip L. Weaver.

For many years breeders of horses, poultry and pet stock, florists and expert gardeners have been working with a conscious basis of the laws of inheritance. Like begets like is a general rule on which they have worked out their standard bred stock. Many experts have more or less clear ideas of the basis of their success, but often they had no power to generalize from their expert experience to crystalize their experiences into a rule or law of breeding. They are the so-called "practical" men who sniff at theory, not knowing that consciously or unconsciously every dealer with the laws of nature must act on a theory before he can produce results otherwise than by pure accident.

Especially is this true with illiterate breeders of horses and poultry. Years of experience has taught them how to arrive at results in certain cases, but they can not or will not give out any general rule on which the inexperienced can act with any understanding. I am impressed with the amount of literature published nowadays on the raising of domestic fowls, and out of that literature how little is based on clear thinking applied to the experience of the writer and clearly expressed.

BREEDING FROM A SPORT.

We know that the White Plymouth Rock was developed by a long line of breeding from a "sport" of the Barred Plymouth Rock fowl, itself an artificial variety produced by crosses of several existing varieties. We know that by careful breeding the barred color was bred out of the strain until now White Plymouth Rock fowls breed true. When asked how this is done, too often the answer is not definite. The chicken men say "By careful breeding." But, what is careful breeding? Is there some mystery that the uninitiated are not supposed to know? Or is it that the expert himself does not know how to formulate rules of breeding for others to follow.

I propose to set down a synopsis of what scientific men today have discovered and believe to be a true law of breeding.

If the practical breeder will listen to the teachings of scientific breeders for more than forty years past, he will find a great light let into his groping task of establishing a new variety of plant or animal. This aid would apply to the poultry man as well as to all other breeders.

I have read many works and papers on poultry and how to breed them, but I have not yet seen therein any reference to Mendel's Law of Breeding. This law is now generally received by the most learned investigators to be established as a fact.

ABBOT MENDEL.

Abbot Mendel was an Augustinian Monk of Brunn in Austria who conducted extensive experiments with cultivating peas in his monastery. He published the result of his experiences in two modest papers about forty years ago, but his work attracted little attention, probably because of the scientific excitement over the discussion of the Darwinian Theory of the Origin of Species through natural selection. In 1901 De Vries in Holland, Correns in Germany, Tschermak in Austria and Speelman in America, rediscovered the same principles of heredity independently, which are now known as "Mendel's Law." Dr. Castle and others have conducted extensive experiments with guinea pigs and white mice which have resulted in a demonstration of the truth of the law. I quote on this subject from a work by Metcalf on Organic Evolution, page 44:

CASTLE'S EXPERIMENT WITH MICE.

"Castle bred white mice and common gray mice together and got the following results: The offspring developed from the first cross were all *apparently* normal gray mice. When, however, a male and female from this first lot of young were bred together very interesting results were obtained. Three-fourths of the young of this second lot *appeared* to be normal gray mice, but one-fourth were found to be *pure white mice*. If two of these white mice were bred together they had white offspring, and the same was true in breeding again from their young, generation after generation, showing that they were of pure strain without admixture from the gray variety, though the original parents in the first cross were one gray and one white.

"It is of great interest to note that, in spite of the crossing of the two varieties, there appeared in the later generations certain individuals which were of pure blood showing no trace

of the admixture which we would expect to find resulting from the cross. Extensive experiments in breeding showed that the results were to be interpreted as follows:

RESULTS.

"A gray mouse 'G' bred with a white mouse 'W' gave offspring which seemed to be all gray, but were really a mixture of gray and white, the gray character being '*dominant*' and the white character '*obscured*' or '*recessive*,' as Mendel called it.

"That is $G \times W$ gave: $G(W)$, $G(W)$, $G(W)$, etc., the parenthesis indicating that the white character was recessive. This hidden complex nature of the second generation (the young from the first cross) was clearly indicated when they were bred together. It was found that their offspring was of three sorts, and that these three kinds were in definite and numerical proportions.

" $G(W) \times G(W)$ gave offspring:

" $1 G + 2 G(W) + 1 W$: one-fourth being pure gray, one-fourth pure white, and one-half apparently gray, but really as further breeding showed, gray and white, the white character being recessive and obscured. These numerical proportions held true for an extensive series of experiments in the case of white mice, as they had done in the experiments of Mendell upon certain plants."

SPORTS.

"Very divergent individuals which arise by variation are commonly called 'sports.' It is easy to see that if a single brood of sports arose which were especially well adapted to their environment, although they might breed with non-divergent individuals of the species, yet among the offspring of the third generation there would be individuals like the original sports."

From this statement of the rule it is evident that the breeder can by selection change the character of the species from the old type to the new type (represented by the sport) by selection and elimination.

It should be stated that Mendel, and Dr. Castle and others who succeeded him found the rule not without exception, for Dr. Castle found that in breeding white and gray mice, that a certain proportion of the offspring from the first cross were not gray or white, but dappled gray and white, and not as we would expect from Mendel's Law.

Having given a bird's-eye view of the subject let us go more fully into Mendel's experiments in detail.

MENDEL'S EXPERIMENTS WITH PEAS.

He experimented with garden peas. All progeny from each cross were kept separate for a number of generations. He selected contrasted characters which are alternative. Seeds, round or angular; pods wrinkled or smooth; stems tall or dwarfed. Take for example his experiments in crossing peas differing only in color of the cotyledons, viz: yellow and green. All the crosses resulting from yellow vines pollinated from green vines were yellow seeds only. There were found to be no green seeds, and no intermediate ones. This characteristic of the crosses is especially to be noted. Mendel applied the term "*dominant*" to the tendency of the yellow color to dominate over the green color. The green color was suppressed in the first generation of crosses, therefore called this "*recessive*".

All the seeds were then grown and the plants of the third generation set seeds. It was found that the third generation differed from the second. They were found to be partly yellow and partly green in the proportion of three yellow dominant characters to 1 green or suppressed color. The actual figures were as follows:

258 seeds apparently yellow, were produced by crossing yellow with green varieties.

258 hybrids when crossed together produced 8023 plants 6022 yellow species to 2001 green species or 3 to 1.

In the second generation 519 seeds resulted in 353 yellow and green mixed and 166 yellow.

The result may be expressed as follows, D representing "*dominant*" and R "*recessive*":

Ovules fertilized by pollen, result in the following progeny combinations:

$$(D + R) \times (D + R), \text{ which is equal to:}$$

$$D^2 + 2 DR + R^2, \text{ which may also be expressed:}$$

$$DD + D(R) + (R)D + RR.$$

The recessive or green seeds, R. R. above, when bred together will not produce any but green seeds. They breed true. But the dominant seeds or yellow all look alike, (the pure stock D D that when bred together breed yellow, true, and the D (R), (R) D, which are apparently yellow, but when bred together do not breed true.) To separate the pure dominant stock, yellow, D D in the diagram, it is necessary to test out the hybrids by self-pollinating each of the plants produced from the yellow seeds. The dominant class D D, or pure yellow stock, will produce yellow seeds alone, while the hybrids D (R), (R) D, apparently yellow, with suppressed green characteristics, will again produce yellow and green seeds in the proportion of 3 to 1.

Thus the D D, or pure seeds of the strain, may be tested out and used to breed true. This result reached by Mendel forty years ago, was further tested and proved recently by Dr. Castle in experiments on guinea-pigs or cavies.

EXPERIMENTS WITH GUINEA PIGS.

He wanted some rough-coated, "rosetted" albino varieties. In order to produce these he commenced with cavies possessing rough-pigmented or colored coat, and albino smooth coat. Observe that the problem was complicated by two alternative characteristics. He had to breed not only for color, as the peas were cultivated, but also for rough or smooth hair in addition. Experiments showed that the rough coat is alternative with, and dominant over, the smooth coat, and also that pigmented or colored coat is dominant over white coat.

Crossing rough colored or pigmented with smooth albinos, it was found that hybrids were produced all of which exhibited only the dominant characteristics, viz: the rough and colored coat.

When bred together the above resolve themselves up into nine categories, though the characteristics are not all apparent. In only three out of sixteen offspring did the hidden or recessive characteristic of albino color and smooth coat appear. The result of three to one was therefore demonstrated. The breeder using Mendel's law would test each rough coated albino for purity, by crossing each with a smooth coated albino, which contained recessive qualities only. The result would be that about one-third of the rough white cavies would produce to this cross only progeny similar to themselves. Others would produce mixed three rough and one smooth albino, and those would be rejected as hybrids.

By this test the individuals of the dominant character D D may be determined without any recessive character D (R), (R) D. They are pure and will remain so.

SEGREGATION AND DOMINANT CHARACTERS.

From these experiments we have two elements, segregation in breeding, and dominant characteristics.

The mathematics of segregation is understood from the nature of the development of the germ cell, but the cause of the characteristic of dominance is a mystery. It is found to be an important element to be reckoned with.

SPECIFIC RESULTS.

With these applications the law becomes a working rule, and poultry breeders with others may intelligently breed in a

characteristic with some precision and intelligence. A distinctive characteristic developed in a sport may be bred in to order, as was done by the breeder of the White Plymouth Rock a "sport" of the Barred Plymouth Rock, an "albino" of that breed which has become a standard variety.

The hit or miss system of breeding from large numbers of individuals to get a result may be reduced to an exact testing out of the individuals which will not breed true, leaving the pure bred stock. There is no mystery about the process of creating a new characteristic in a variety when we understand Mendel's Law, now an accepted rule among scientific men, and poultry men among others should understand it.

Briefly expressed, Mendel's Law may be stated thus:

In the second and later generations of a hybrid, every possible combination of the parent characters occurs, and each combination appears in a definite proportion of the individuals."

BOARD OF AGRICULTURE AND FORESTRY.

Division of Entomology.

REPORT OF HORTICULTURAL-QUARANTINE INSPECTION WORK.

Honolulu, Hawaii, June 28, 1907.

To the Honorable Board of
Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen: Since my last report one month ago I have to report the arrival of 68 steam and sailing vessels from outside the Territory on part of which we found 13,552 packages of fruit and vegetables, 9 bales and cases of trees, plants, etc., and 87 packages of plants and seeds by mail. Two bales of trees arrived from Iowa in very bad condition owing to being badly packed in straw and burlap so that the air passed through the bales and the trees and plants were dried up. A large case of orchids arrived from England in good condition after their long journey. We destroyed a few small lots of fruit brought by passengers from the Orient. As it was of no great value we preferred not to take the chances of introducing any fruit flies that are found in certain fruits in those countries. On the S. S. "Siberia" arrived from the Orient April 22nd a case of sugar cane cuttings, the latter had been dipped in parafine wax. I had the case and cuttings fumi-

gated with hydrocyanic acid gas to prevent the escape of any insects. I then submitted a small section of the cane to Dr. Lewton-Brain, the pathologist, as it had evidence of disease and the following is his report thereon:

"I have examined the specimens of diseased cane you submitted to me this morning, after a thorough disinfection. The sticks were evidently very badly diseased and as the discoloration had not yet extended to the end, it seems certain that they were infected to begin with and did not become so while in transit. I am sorry I cannot identify the disease, but I could not discover any fructification of the fungus, nor do we know enough of Oriental cane diseases for me to identify this from the symptoms.

"The symptoms do not agree with any Hawaiian cane disease known to me and though, as I have said, we know little of Oriental cane diseases, the probability is that there are some which are unknown elsewhere altogether, therefore, it would be highly unsafe to admit these canes into these islands, and the sooner they are destroyed the better."

The cane and case were burned in a furnace near the dock.

In April we received a strong colony of internal parasites of the citrus aphis from Mr. E. M. Ehrhorn of California. We liberated several colonies of this valuable little hymenopterous parasite on orange trees infested with the orange aphis in the suburbs of Honolulu and on the 2nd day of May Mr. Kotinsky liberated a strong colony at Wahiawa. We are in hopes that they will reduce the number of that dirty orange pest.

During the past two weeks my assistants, Mr. Kotinsky and Mr. Jordan, have been distributing colonies of the "horn fly parasite" (*Eucoila impatiens*) in various stock breeding districts and it is satisfactory to know that the colonies are becoming well established.

Colonies of the "Torpedo fly" (*Siphanta*) egg parasites were sent to Inspector Newell of Hilo about a year ago and have increased so rapidly that he has been able to send out colonies free to parties that have made application to this office for them.

Mr. Kotinsky and I have made another inspection tour of the various small Indian mango trees that were fumigated for the mango scale and found that good work has been done. The scales were dried up. A visit to the estate where the original imported Indian mango trees were planted, that was fumigated nearly a year ago, showed to have made a very satisfactory growth and we found no trace of living mango scales.

Respectfully submitted,

ALEXANDER CRAW,
Superintendent of Entomology and Inspector.

THE CAMPHOR INDUSTRY.

An Address Before the Fifth Annual Meeting of the Farmers' Institute of Hawaii by Leopold G. Blackman.

So many new agricultural enterprises have been advocated of late, as offering alluring prospects to the Hawaiian cultivator, that one is somewhat reluctant in suggesting another. Still it appears expedient that this Territory should exert every means to develop to the full the productive capacity of its available land, and in view of the very great diversity of condition offered by our various soils and altitudes, this can only be accomplished by having recourse to many different agricultural enterprises. If, however, after a consideration of the merits of the camphor tree, it be not decided to include its cultivation among those agricultural undertakings already established here, the preparation of this paper will not have been altogether useless, for it will assist Hawaiian planter to weigh the merits of a new industry which is now attracting considerable attention among tropical growers of other countries.

SOURCE OF SUPPLY.

The production of camphor is at present almost exclusively confined to Formosa: The camphor forests of this large island, when first visited by Europeans, were very extensive and reached well into the plains. Improvident harvesting, however, gradually reduced them, although fifty years ago they still covered the lower ranges of the mountains now occupied by tea and other gardens. At that time the demand for camphor was comparatively limited, and the price in consequence was much lower than has prevailed of late years. The work of destruction of camphor trees, however, continued steadily, and the denudation of the forests, coupled with an incessant warfare between the Chinese, who controlled the trade, and the inhabitants of Formosa, disorganized the production and rendered the procuring of camphor more and more difficult. These unsettled conditions exercised a direct influence on the price of the commodity, which has perhaps fluctuated as greatly as that of any other agricultural product, with a general tendency always to advance. Since the occupation of Formosa by Japan, a few years ago, the latter country has controlled the production and export of camphor, and has established a government monopoly in this industry, which it jealously guards. The chief result to the consumer of this restriction in trade has been an advance in the price of camphor of about fifty per cent. Another effect which has been brought about, has been the steady decline of the refining of camphor in Europe and the United States, in which countries many refineries of crude camphor have abandoned business, and the process may now be said to have passed into the control of the Japanese.

SUPPLY AND DEMAND.

Hitherto, the export of camphor from Asiatic countries to America and Europe has amounted to about eight million pounds per annum, of an approximate value of two or three million dollars. As the production of camphor has hitherto been unscientific and improvident, and has been achieved only at the total destruction of the tree which produces it, there has for some years been a gradual and appreciable diminution of the available supply. At the same time the uses of the commodity have greatly increased. These two factors combined, which have a close parallel in those which have affected the rubber market, have brought about a marked advance in the price of camphor, which will probably continue for many years. Indeed, as the Formosa natural forests become exhausted and the demands of the smokeless powder and celluloid makers increase, it is impossible to predict to what extent the price may advance, until affected by the scientific cultivation of the tree. Demand has, however, obtained such a start in the race against supply, that the latter, hindered with the handicap of some few years necessary to the establishment of plantations and the determination by experiment of the best methods of production and refinement, must necessarily take a long period to bring about a proper economical balance between these two factors. At present there appears very little prospect of low prices and the grower of camphor has at least as alluring an incentive in the way of an eager market, as is held out to the rubber planter. As the camphor now produced is practically confined to the Orient, the establishment of the industry in Hawaii is one of promise, as it would be in a most advantageous position to supply the home market and would have in addition the benefit of the tariff, with which the foreign grower has to contend.

HISTORY OF CAMPHOR.

The word "camphor" is found with various alterations throughout all oriental languages, and this similarity indicates that a knowledge of the value of the tree has long been known and has probably been derived from a common source. It is mentioned first, in Arabic literature, as early as the sixty century, and Marco Polo relates that he saw large forests of this handsome tree.

DESCRIPTION AND PROPERTIES.

Camphor is a vegetable product obtained generally by wood distillation, but it is also sparingly found as a natural secretion. It exists as a white translucent crystalline mass, of a characteristic pungent odor and a peculiar acrid disagreeable taste. It is generally very tenacious and practically impossible to pulverize without the addition of a small quantity of alcohol, when it disintegrates readily upon pounding. It burns with a yellow flame and

leaves no residue. It is volatile, almost insoluble in water, but readily so in alcohol, from which it is precipitated by the addition of water. It floats on the latter fluid upon which small particles of it rotate until oil is added.

USE.

One very interesting feature connected with this subject, is the various uses to which this valuable product has been put at different periods. In the early ages it was regarded chiefly as a costly perfume, and it still finds a place in the perfumer's art. It afterwards was included into the realm of medicine by the compilers of the medieval pharmacoepia, together with many other ingredients of often less delectable a nature and smaller claim to merit. To this day it is regarded as a specific for certain ailments by homoeopathic and allopathic practitioners alike. Its chief use at present is in the manufacture of the two modern products, smokeless gunpowder and celluloid, and to the makers of these articles is to be attributed at once the growing demand for camphor and its quickly advancing price.

CAMPHOR WOOD.

The wood of the camphor tree is in great demand for cabinet work. It is of a beautiful yellow color and possesses a soft silky texture. It has the property of resisting the ravages of insects and its aromatic odor enhances its value for many purposes. The tree has the additional quality of possessing hygienic value. This has long been recognized in Japan where it is regarded with great veneration and may frequently be seen growing in the vicinity of temples. By no means the least valuable property of this article, and one which is probably little known, is its ability to improve the germinating property of seed. A small piece of camphor dissolved in water will not only hasten and improve the vitality of seed soaked in it, but is also of use in stimulating into growth, cuttings of rose and other plants, which have been subjected to long journeys.

ORIGIN OF CAMPHOR.

Camphor is produced by several different species of trees, chief among which is *cinnamomum camphora*, a native of Eastern Asia. This may be regarded as the camphor tree proper. It is an exceedingly handsome evergreen, which reaches a height of over one hundred feet. This tree, the source of Formosa camphor, is now being cultivated not only in Ceylon and India, but also in California and Florida and in many European countries, notably France and Italy. It is said that a large tree will yield over a thousand dollars worth of camphor.

Another, though less known camphor yielding tree, is the *Dryobalanops camphora* of Sumatra, which produces what is

known as Malay camphor. The crystals of this tree are found in clusters under the bark, in knots, and occupying longitudinal fissures in the heart of the tree. In order to obtain it, the trees are destroyed by the natives who are said to often procure about ten pounds from a mature tree.

FORMOSA OR CHINESE CAMPHOR.

Formosa camphor has hitherto been shipped to Europe and America through Chinese ports. For this reason it is generally known as Chinese camphor. It is produced by a crude process of distillation, billets of the wood being boiled in water in large containers covered with straw, luted with clay. These containers or retorts generally hold about four hundred pounds of wood, which is renewed every day for about ten days. At the end of this time the crystals of camphor are found adhering to the straw upon which it has been deposited. It reaches the markets in an impure and moist condition in lead-lined chests each containing about one hundred and fifty pounds. The moist nature is due to the addition of water which is used to prevent volatilization.

JAPANESE OR DUTCH CAMPHOR.

Japanese camphor reaches the market by way of Batavia, and is therefore often called Dutch camphor. It is usually of larger grain, is pinkish in color and of superior quality than the Chinese product and is received dry. It is packed in tubs containing about one hundred and twenty-five pounds and is sometimes also known as tub camphor. Wooden condensers and bamboo tubes are used in the process of production.

REFINING.

The process of refining camphor was long kept secret and for a time the city of Venice maintained a monopoly of the art. The method is termed "sublimation" and its object is to free the crude product from impurities. It bears the same relation to the refining of solids as distillation does to the manufacture of liquids. The process is now well known and it has been carried on successfully in many large cities, although as has been said, the difficulty in securing the crude material has practically forced American and European refineries from the field. Briefly the method is conducted as follows:

The camphor is first broken into small pieces, and about three per cent. of slaked lime and two per cent. of iron filings being added, it is placed in glass flasks imbedded in sand. These are then gently heated to about 190 degrees C. for an hour to expel moisture and then to about 204 degrees C., at which temperature it is maintained for twenty-four hours. The flasks are now corked and the sand is removed from the upper portion, where the cam-

phor condenses in pure white crystals. If air is permitted to enter the flasks during this process, the camphor becomes opaque in appearance and consequently less attractive. The flasks are finally sprinkled with water and being broken, the camphor is removed from the upper shoulder where it has collected. Each flask produces a circular cake or bell about twelve inches across, and some three inches thick, weighing about ten pounds. The object of this process is to retain the temperature just below the degree of volatilization. The lime is used in order to free the camphor from any resin which may be present and the iron in the same way takes up whatever sulphur there may be. Charcoal is frequently also employed to remove any foreign coloring matter.

RESUBLIMATION.

In former times the camphor was in Europe subjected to a further operation termed "resublimation." This process was not only useless from a practical point of view, but pernicious to the consumer, as its object was to introduce to the mass about fifteen per cent. of interstitial water in order to increase its bulk. The peculiar property of thus absorbing moisture was long made use of and only abandoned with reluctance, as the device well repaid the cost of operation.

CULTIVATION.

The cultivation of the camphor tree is attracting considerable attention in Ceylon, where it is found to flourish at altitudes, from sea level to five thousand feet and upwards. The old, destructive method of obtaining the camphor is now being abandoned as too improvident to repay the expenses of cultivation. The distillation of camphor direct from the wood is, however, still practiced, but planters are commencing to experiment in other and less wasteful processes. In this respect the analogy between the causes affecting rubber and camphor industries, already alluded to, has another parallel, for whereas with the best variety of rubber—the Para—the knowledge of a satisfactory process of obtaining the lac is still in abeyance and depends upon experiment, the same experimental period is being undergone to discover the most economical production of camphor. There seems to be a general tendency to look towards the leaves and new twigs as to the future source of commercial camphor. It is found that the valuable product is distributed throughout the whole system of the tree, and a method of cultivation, depending upon the production of a large quantity of leaves and twigs, is probably the one which will be aimed at.

ESTIMATED YIELD.

To effect this it is proposed in Ceylon to plant the trees in rows,

about eight feet apart and running across the direction of the prevailing winds—about two to three feet being allowed to each tree. By a system of rigorous pruning the trees would be kept from becoming tall, thus diminishing the cost of labor, and would be induced by constant clipping, to yield a maximum foliage. Experiments conducted on a small scale have shown that trees planted twelve feet apart yield nearly fifty pounds of clippings per tree. As the process may be repeated four times a year about 50,000 pounds of green clipping would be the annual yield per acre. The yield of camphor from fresh leaves is variously estimated at from $1\frac{1}{2}$ to 2 per cent. and of the twigs at a little more than 2 per cent. Taking the production of the two sources combined at only $1\frac{1}{2}$ per cent., the annual crop of camphor per acre would be about 750 pounds. This under the system suggested of closely planted hedges should with care be increased to about one thousand pounds per acre.

The present price of camphor is about 65 cents per pound, but basing our estimate at 50 cents and the annual yield at 750 pounds, the gross return per acre would be about \$375. It is estimated that the cost of planting, weeding, distillation and fuel would amount to \$75, giving a net return per acre of \$300. As the uses of this article are greatly increasing, and the supply tending to diminish, the profit per acre would probably be greater than the above estimate upon large plantations, as soon as the most weighty economical problems of the industry have been solved. However taking the moderate price of our estimate, adding one-third more for labor and reducing the anticipated harvest by a like amount a net income of \$150 per acre should be secured. On a small plantation of six acres—a venture probably within the reach of almost every one here present—an income of nearly one thousand dollars per annum should be secured in about four years.

COST OF PLANTING.

The present price in Japan of young camphor trees, about a foot and a half high, is \$100 per thousand. Good results, however, may be obtained from seed, which ripens in Japan in October and November. The seed generally does not preserve its vitality unimpaired for a length of time and before planting, it should first be soaked in water for twenty-four hours or upwards. The best seed will be found to sink to the bottom. In planting the seed a well fertilized sandy loam is preferred. Upon this it is sprinkled and covered with sifted earth for about half an inch. About two thousand plants may be obtained from one pound of seed. To conserve moisture and protect the young plants from the sun when they first appear, straw should be strewn upon the bed and a few stakes inserted in the ground to prevent it from blowing away. The trees should be transplanted 6 inches apart and when about 12 inches high should be set out permanently. Clipping may be

commenced at three years. At five years old, if not pruned, the trees attain a height of about twenty feet and a spread of about ten feet.

The cultivation of camphor is now engaging the attention of the Secretary of Agriculture. There is little doubt that the next ten years will see this industry well established on a profitable basis in many countries. At present great difficulty is experienced in procuring seed, as the Japanese are guarding the industry very jealously. It is said, however, that the plant grows well from cuttings, and as there are a few trees already established in Hawaii, and generally thriving well, there may be a possibility of procuring sufficient seeds and cuttings locally. The whole question of the successful cultivation of camphor has yet to be answered, but to anyone possessing land in Hawaii not suited to rubber, tobacco, sisal or citrus fruits, or holding more land than they care to put under the above crops, my advice is emphatically, to experiment in camphor.

NEW PUBLICATIONS.

FARMERS' FULETINS.

The following recent Farmers' Bulletins may be obtained free from the Secretary of Agriculture, Washington, D. C.:

Bulletin 276. Experiment Station Work. XXXIX. Pp. 32, figs. 2. Contents: Improvements in peach growing—Mulberries—Alfalfa in the Eastern States—Oat culture in the South—Improvement of grass land—Succotash as a soiling crop—Tankage and bone meal for hogs—Grinding corn for hogs—Dips as lice killers—Digestibility of fish and poultry—Honey vinegar—The farm wood lot.

Bulletin 277. The Use of Alcohol and Gasoline in Farm Engines. By Charles Edward Lucke, Assistant Professor of Mechanical Engineering, Columbia University, and S. M. Woodward, Irrigation Engineer, Office of Experiment Stations. Pp. 40, figs. 12. This Bulletin deals with the cost and thermal efficiency of different fuels; the need of power for pumping purposes in irrigated districts; the use of gasoline engines on irrigated farms, and their adaptability to the use of alcohol, with a report of practical experience with alcohol engines in Germany.

Bulletin 278. Leguminous Crops for Green Manuring. By C. V. Piper, Agrostologist in Charge of Forage Crop Investigations, Bureau of Plant Industry. Pp. 29, figs. 14.

Bulletin 280. A Profitable Tenant Dairy Farm. By Lyman Carrier, Scientific Assistant, Farm Management Investigations, Bureau of Plant Industry. Pp. 16, figs. 3.

Bulletin 288. The Nonsaccharine Sorghums. By C. W. Warburton, Assistant Agriculturist, Farm Management Investigations, Bureau of Plant Industry. Pp. 30, figs. 9.

Bulletin 282. Celery. By W. R. Beattie, Assistant Horticulturist, Bureau of Plant Industry. Pp. 38, figs. 16. This Bulletin gives the botany and climatic and soil requirements of the celery plant, directions for its cultivation, storage, and marketing, with a description of its insect enemies and methods for their control. It is designed to supersede Farmers' Bulletin 148, on the same subject.

Bulletin 289. Beans. By L. C. Corbett, Horticulturist, in Charge of the Arlington Experimental Farm, Bureau of Plant Industry. Pp. 30, figs. 12. Kinds of beans and their respective merits, cultural operations, harvesting, cleaning, and grading are detailed. Growing on a commercial scale and in the garden are both treated.

Bulletin 291. Evaporation of Apples. By H. P. Gould, Assistant Pomologist, Bureau of Plant Industry. Pp. 40, figs. 16. A timely account of methods of drying fruit by artificial heat. The kinds of evaporators, with their advantages, special appliances for handling, and methods of preparing and handling fruit, are set forth. Grading, packing, storing, prices, and laws on evaporated fruits are also discussed.

Bulletin 292. Cost of Filling Silos. By Lyman Carrier, Scientific Assistant, Farm Management Investigations, Bureau of Plant Industry. Pp. 15, figs. 3. This brief account, with accompanying tables, supplies full and valuable information on a subject which is growing in interest with the increased use of silos.

Bulletin 293. Use of Fruit as Food. By C. F. Langworthy, in Charge of Nutrition Investigations, Office of Experiment Stations. Pp. 40, fig. 1. A revision and extension of an article published in the Department Yearbook of 1905. Composition and digestibility of fruit, with the effect of ripening on composition, are leading features. Ways of cooking and serving, with directions for handling, marketing, and storing, are also given.

IRRIGATION AND DRAINAGE INVESTIGATIONS.

Bulletin 183. Mechanical Tests of Pumping Plants Used for Rice Irrigation in Louisiana and Texas, 1905 and 1906. This bulletin gives the details of a large number of mechanical tests of pumping plants used for rice irrigation in Louisiana and Texas. Most of these plants use crude oil for fuel, and they are therefore of special interest to those using this fuel. It also includes estimates of the cost of different types of plants and their cost of operation, showing that in most instances the high-class machinery is very little, if any, more expensive in first cost and very much cheaper in operation.

Application for this bulletin should be made to the Director of the Office of Experiment Stations, Washington, D. C.

THE USE OF THE NATIONAL FORESTS.

The above publication has recently been issued by the Department of Agriculture, and is a brief, clear manual for public information as to the forest policy of the National Government.

It is too true, as the short preface says, that "many people do not know what National Forests are. Others may have heard much about them, but have no idea of their true purpose and use." It is the object of this publication to explain just what the National Forests mean, what they are for, and how to use them.

In the first place, it is explained how the Forests are created and how their boundaries are drawn. Next, their direct use and value are shown from the point of view of the homeseeker, the prospector and miner, the user of timber, the user of the range, the user of water, and other users of Forest resources. Third, it is shown how the Forests are intended for use, for the production of usable products, and for the establishment and maintenance of homes; how on all of them the timber is protected from fire, the water flow is kept steady, the forage on the range is increased and guarded from abuse; and how, in addition, they serve as great public playgrounds and as breeding places and refuges for game. Finally, the management of the National Forests is described.

Here it is that the great usefulness of the Forests is brought out most clearly and strikingly; for the Forests are managed by the people in their own interests, and every means is used to meet the desires and wants of all Forest users half way by dealing with them in the main directly on the ground and in all cases with the utmost practicable dispatch and freedom from red tape.

In a word, the special interest of this manual lies in its showing that the Forest policy of the Government, both in principle and in practice, is for the benefit of the ordinary man, for the benefit of every citizen equally. There is still a tendency to think of the National Forests as "preserves" closed to use, and to leave the public lands exposed to unregulated individual exploitation. Where these misapprehensions still prevail "The Use of the National Forests" will go far to correct them.

The book is written by Mr. Frederick E. Olmsted, whose intimate knowledge of conditions in the West and the policy under which the National Forests are managed especially fits him to deal with the subject.

HAWAIIAN ENTOMOLOGICAL SOCIETY'S PROCEEDINGS.

Part 3 of Volume I of the proceedings of the above society has just been issued. It contains much valuable data, chiefly

on Hawaiian entomology. Copies of this publication may be obtained at 50 cents each, by application to the secretary or treasurer of the society, Honolulu.

CORRESPONDENCE.

Editor Forester: Would you kindly put me in communication with the right party to supply me with eggs of pure White Leghorns and B. Plymouth Rocks, or better ask such a party to send me prices of above. I would also like to have price of trio of each of the above breeds—cockerel and two young pullets.

Respectfully,

CORRESPONDENT (Hawaii).

Answers to above, if directed care of Editor of Forester, Box 59, Honolulu, will be promptly forwarded to our correspondent.

We have received by the Alameda a letter from Dr. Cobb of the Bureau of Plant Industry, who is well known to our readers. In it he very kindly offers to furnish Hawaiian pineapple growers with any additional information they may desire arising from the publication of his article on pineapple diseases which appeared in the May Forester. He also adds: "I am most pleased to receive the Forester still. The news about the Regents for the Agricultural College was very interesting. I am gradually becoming settled in my new work, and shall, in time, I hope, be able to send you something in print that may interest you."

Forester readers desiring to correspond with Dr. Cobb, relative to the information he offers, should address their letters: Dr. Cobb, Crop Technology, Bureau of Plant Industry, U. S. Department of Agriculture, Washington, D. C.

FIFTEENTH NATIONAL IRRIGATION CONGRESS.

The fifteenth National Irrigation Congress will be held in Sacramento, California, September 2-7, inclusive, 1907. The four great objects of the Congress are to "save the forests, store the floods, reclaim the deserts and make homes on the land."

All who are interested in these achievements are invited to attend the Congress, and, by participating in its deliberations, contribute to a wise direction of national policies and to the development of practical methods of conserving and developing the great natural resources of the country, thereby insuring a greater stability of prosperous conditions, extending the habitable area, increasing the products of the land, and increasing internal trade and commerce.

Through the efforts of the past Irrigation Congress a fund of forty million dollars has been collected, which enormous amount is being expended in the construction of twenty-five great irrigation projects which will result in a cultivated area of not less than three million acres of crop-producing land.

National and State officials, irrigation and forestry experts, engineers, farmers and irrigators, manufacturers, professional and business men, industrial workers, editors and other representatives of the press will attend the Congress.

Simultaneously with the Irrigation Congress there will be held at Sacramento an Interstate Exposition of Irrigated Land Products and Forest Products. The exhibition of irrigated products will be the finest ever assembled anywhere in America.

The California State Fair will follow the Congress, opening on September 7th, when the joint closing and opening ceremonies will be attended by a great irrigation celebration, the day closing with a magnificent allegorical irrigation parade and electrical illumination.

California affords many opportunities for the study of irrigation, irrigation practices and results, irrigated crops of every kind and irrigation opportunities. Sacramento, the capital city of California, where the Congress will be held, is situated near the center of the great valley which extends lengthwise through the State a distance of nearly five hundred miles and comprises approximately ten million acres of fertile land. Colossal plans for the construction of storage dams, and distributing canals for the irrigation of this great plain are now being made by engineers of the Reclamation Service and money has been apportioned from the reclamation fund for the construction of an initial unit of the great system contemplated.

September is a season of fruits and grapes in California and visitors to the Congress will have opportunities at Sacramento and throughout the State of enjoying the best that California orchards and vineyards yield and of enjoying it fresh from tree and vine.

The program of the Congress will consist of addresses by men eminent in this and other countries, carefully prepared papers by administrative officials and engineers of the National Reclamation Service and Forest Service, with ample provision for volunteer speeches and discussion.

All delegates will be invited to visit San Francisco, where re-building operations are being carried forward on a scale so vast as to render that city today the greatest and most interesting exhibition of man's constructive genius, civic pride and commercial enterprise ever witnessed in the world.

RECENT LEGISLATION.

(Continued.)

ACT 23.

An Act to Amend Section 1409 of the Revised Laws of Hawaii, Relating to Licenses of Tobacco, Cigars and Cigarettes.*Be it Enacted by the Legislature of the Territory of Hawaii:*

Section 1. Section 1409 of the Revised Laws of Hawaii is hereby amended so as to read as follows:

"Section 1409. Fee. The annual fee for a license to sell tobacco, leaf tobacco, cigars or cigarettes, shall be Ten Dollars.

A grower of tobacco shall not be required to pay and shall be exempt from paying the said annual fee of Ten Dollars for the sale by him of tobacco or leaf tobacco grown or produced by him or received by him as rent from tenants who have produced the same on his lands. Provided, that nothing in this Section shall be construed to exempt any grower of tobacco from the annual fee of Ten Dollars who by peddling, or otherwise, sells tobacco, or leaf tobacco, at retail directly to consumers."

Section 2. This Act shall take effect from the date of its approval.

Approved this 25th day of March, A. D. 1907.

G. R. CARTER,
Governor of the Territory of Hawaii.

ACT 77.

An Act Amending Section 1223 of the Revised Laws of Hawaii Relating to the Exemption from Taxation of Property Used in Certain Industries.*Be it Enacted by the Legislature of the Territory of Hawaii:*

Section 1. That Section 1223 of the Revised Laws of Hawaii is hereby amended so as to read as follows:

"Section 1223. Property used in certain industries. For the five years from December 31, 1907, all property, real and personal, solely and actually used in the cultivation and production of sisal fibre, castor oil, copra, vanilla extract, Hawaiian starch, pineapples, arrowroot and manioc starch (Kasawa), shall be exempt from property taxes thereon; provided, however, that such exemption shall not apply to any land in excess of forty acres so used by any one person, firm or corporation in the cultivation and production of pineapples."

Section 2. This Act shall take effect from and after the date of its approval.

We hereby certify that the foregoing Bill, after reconsidera-

tion on the veto of the Governor, was, upon a vote taken by Ayes and Noes, approved by a two-thirds vote of all of the elective members of the Senate and House of Representatives of the Territory of Hawaii, on the 17th day of April, A. D. 1907.

E. F. BISHOP,
President of the Senate.
H. L. HOLSTEIN,
Speaker, House of Repre-
sentatives.

WILLIAM SAVIDGE,
Clerk of the Senate.
JNO. H. WISE,
Clerk, House of Repre-
sentatives.

DIVISION OF FORESTRY.

PROCLAMATION OF THE RESERVATION OF CERTAIN LANDS IN THE KOOLAU AND THE HANA FOREST RESERVES, ISLAND OF MAUI.

Under and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of Hawaii, enacted February 27, 1905, as amended by Act 65 of the Session Laws of 1905, enacted April 26, 1905, and by Act 4 of the Session Laws of 1907, enacted March 5, 1907, and of every other power me hereunto enabling, I, A. L. C. ATKINSON, Acting Governor of Hawaii, having held the hearing, of which notice had been duly given, as in said acts provided, do hereby set apart as integral parts of the Koolau and the Hana Forest Reserves on the Island of Maui, subject to the existing leases, as provided by law, the government forest lands described below.

KOOLAU FOREST RESERVE.

In the Koolau (Maui) Forest Reserve, I do hereby set apart, as integral parts of that reserve, those portions of the tracts of government land (more particularly described below) known as Honomanu, Keanae Mauka, Wailua 1 and 2 Mauka, Wailua-Ulaino Forest and Hana Forest, which lie within the boundaries of the Koolau (Maui) Forest Reserve, the location and metes and bounds of which said reserve, situate in the Districts of Koolau and Hamakualoa, Island of Maui, are more particularly described by and on a map made by the Hawaiian Government Survey Department, which said map is now on file in the said Survey Department, marked "Registered Map No. 1268" and "Koolau Forest Reserve, Maui"; and a description accompanying the same, numbered C. S. F. 1630, which said description, now on file in the said Survey Department, as is follows:

Beginning at a point on the boundary line between the Districts of Hana and Koolau, where the mauka boundary of the Nahiku homesteads if projected easterly would intersect the said District line, the boundary runs:

1. In a general north-westerly direction to and along the mauka boundary of the Nahiku Government homesteads to the gulch between the lands of Kapaula and Puakea, or Paakea, said gulch being also named Waiaaka gulch on Public Lands Map No. 20 of Nahiku, about 22,000 feet in a direct line;

2. Thence makai, down said Waiaaka gulch to the Koolau Ditch, about 2,800 feet in a direct line;

3. Thence in a general westerly direction along the Koolau and Upper Hamakua Ditch trail to the western boundary of the land of Opana in the District of Hamakualoa, about 61,000 feet in a direct line;

4. Thence mauka along the westerly boundary of said Opana to the makai boundary of the land of Haiku-uka, belonging to the Haiku Sugar Company and Paia Plantation, about 20,000 feet in a direct line;

5. Thence, in a general westerly direction, along the makai boundary of the said Haiku-uka land of the Haiku Sugar Company and Paia Plantation, to the Maliko Gulch, near Pali o Ka Moa, about 2,000 feet in a direct line;

6. Thence south 34° east, true, 17,800 feet, along the land of Makawao to the summit of the hill called Puu o Kakae;

7. Thence south $53^{\circ} 21'$ east, true, 42,980 feet, along the land of Kalialinui, crossing the Koolau Gap, to Pohaku Oki Aina;

8. Thence in a general easterly direction, along the northern crest of the Kipahulu Valley to a point where the boundary line between the Districts of Koolau and Hana intersects the Kipahulu Valley, about 10,000 feet in a direct line;

9. Thence in a general north-easterly direction, along the said boundary line between the said Districts of Koolau and Hana to the point of beginning, about 21,500 feet in a direct line. The various distances in the above description are approximate only, being scaled from the map showing the reserve boundary.

Area, 42,969 acres, more or less.

The location and metes and bounds of each of the above named tracts are more particularly described by descriptions prepared by the Hawaiian Government Survey Department, numbered C. S. F. 1630, which said descriptions, now on file in the said Survey Department, are as follows:

Portion of Government land of Honomanu, within the Koolau (Maui) Forest Reserve, and covered by Lease 52.

Beginning at Kikau, a hill at the southeast corner of the land of Honomanu and on the boundary of Koolau and Hamakualoa districts, and running:

1. In a northwesterly direction across Honomanu Valley and ravine and along Haiku, in Hamakualoa district, to eastern bank of stream in Napuumahoinui ravine, distance 7,035 feet;

2. Thence in a northeasterly direction along Koloa and along east side of stream in Napuumahoinui ravine to the Koolau Ditch Trail, distance about 13,200 feet;

3. Thence in a southeasterly direction along the Koolau Ditch Trail to the western brink of Nuaailua stream, direct distance about 8,000 feet; said Koolau Ditch Trail being the makai boundary of the Koolau (Maui) Forest Reserve;

4. Thence in a southwesterly direction along the western bank of the Nuaailua stream to the initial point, distance about 9,200 feet.

Area, 2,000 acres.

Compiled from Lease No. 52 and C. S. F. 1630.

Portions of Government lands known as Keanae Mauka, Wailua 1 and 2 Mauka, and Wailua-Ulaino, within the Koolau (Maui) Forest Reserve, Koolau, Maui, and covered by Leases 538 and 539.

Beginning at Kikau, a hill at the southeast corner of the land of Honomanu and on the boundary of Koolau and Hamakualoa districts, and running:

1. In a northeasterly direction along the Nuaailua stream along the land of Honomanu to the Koolau Ditch Trail, distance about 7,500 feet;

2. Thence in a general easterly direction along the Koolau Ditch Trail to the western brink of the gulch between the lands of Kapaula and Puakea (or Paakea), said gulch being also named Waiaaka Gulch on

Public Lands Map No. 20, the direct distance being about 23,000 feet; said Koolau Ditch Trail being the makai boundary of the Koolau (Maui) Forest Reserve;

3. Thence southwesterly along the western brink of the Waiaaka gulch to Palaha, a point on the edge of the Crater of Haleakala, and at the junction of the districts of Koolau, Hamakualoa, Hamakuapoko, Honauula, Kahikinui, Kaupo and Hana, direct distance about 30,400 feet;

4. Thence northwesterly along the land of Haiku, Hamakualoa district, to a hill on the western edge of the Keanae Valley, distance about 32,490 feet;

5. Thence northeasterly along the land of Haiku, Hamakualoa district, to the initial point, distance about 7,660 feet.

Areas—

In Keanae Mauka	8,750 acres
In Wailua 1 and 2 Mauka.....	1,280 acres
In Wailua-Ulaino	3,000 acres
Total area	13,030 acres

Compiled from Leases 538 and 539 and C. S. F. 1630.

Portion of Government land known as Hana Forest, Lease 492, (being more properly a portion of the Wailua - Ulaino Forest), and within the Koolau (Maui) Forest Reserve, Koolau, Maui.

Beginning at a point on the boundary line between Hana and Koolau districts where the mauka boundary of the Nahiku Homestead if projected easterly would intersect the said district line, and running:

1. In a northwesterly direction to and along the mauka boundary of the Nahiku Homesteads, distance about 3,300 feet; thence

2. S. 45° 30' W. true 3,900 feet, a little more or less, along Government land;

3. S. 11° 00' W. true 11,800 feet, a little more or less, to a point on dividing ridge between Hana and Koolau districts;

4. Thence northeasterly along boundary between said districts to the initial point, distance about 14,700 feet.

Area, 900 acres.

Compiled from C. S. F. Nos. 744 and 1630.

HANA FOREST RESERVE.

In the Hana Forest Reserve, I do hereby set apart, as integral parts of that reserve, those portions of the tracts of government land (more particularly described below) known as Hana Forest, Wakiu, Kawela-Kaeleku, East Honomaele and Koali-Puuhaoa, which lie within the boundaries of the Hana Forest Reserve, the location and metes and bounds of which said reserve, situate in the District of Hana, Island of Maui, are more particularly described by and on maps made by the Hawaiian Government Survey Department, which said maps are now on file in the said Survey Department, marked "Registered Maps Nos. 1268 and 1750" and "Hana Forest Reserve, Maui"; and a description accompanying the same, numbered C. S. F. 1690, which said description now on file in the said Survey Department, is as follows:

Beginning at Puu Hinai, a hill on the boundary of Hana and Koolau districts, and the southeast corner of the land of Ulaino, (L. C. A. 8515 B. to Kanehoa), and running as shown on Government Survey Registered Map No. 1750;

1. In a southeasterly direction across the lands of Makapuu (Government), West Honomaele (fee simple), East Honomaele, Kawela, Kaeleku (all Government), to a point on the shoulder of the hill called Olopawa, 1,000 feet northeast of the Government Survey Trig. Station "Olopawa";

2. Thence southeasterly across the Government lands of Honokalani,

Wakiu and Kawaipapa to a point on the pali of the Kawaipapa gulch at the northwest corner of Grant 3154 to Kahoomakaulii;

3. Thence along the following grants: 3154 to Kahoomakaulii, 3193 to C. Kakani et al., 883 to G. P. Judd, and L. C. A. 443 to Richardson, to the southwest corner of L. C. A. 443 to Richardson;

4. Thence southerly across the fee simple lands of Aleamai (L. C. A. 8660 to Kukamauna no Kaleimakalii) and Haneoo (L. C. A. 8525 B. to Kauwa) to the northwest corner of Grant 2879 to John Rae;

5. Thence across said grant to its southwest corner;

6. Thence across Government land to Kakio to a point on the northern boundary of Government land of Waiohonu;

7. Thence southwesterly across Waiohonu to a point on its south boundary, where the line makes an angle;

8. Thence across Government lands of Puuiki-Papahawahawa to a point on the northeast boundary of Muolea (L. C. A. 8452 to Keohokalole) where said boundary turns almost due east;

9. Thence across Muolea (L. C. A. 8452 to Keohokalole) to the northwest corner of Grant 382 to E. Whittlesey;

10. Thence along mauka boundary of Grant 382 to E. Whittlesey;

11. Thence across Government land of Wailua to northwest corner of Grant 1165 to C. A. Bouillon;

12. Thence along mauka boundary of Grant 1165 to C. A. Bouillon to said grant's southwest corner;

13. Thence across Government lands of Paehala and Puaaluu to the boundary between the districts of Hana and Kipahulu;

14. Thence following up said district boundary until it intersects with the boundaries of Koolau, Hamakualoa, Wailuku, Honuauula, Kahikinui and Kaupo districts at the large rock on the northeast brink of the crater of Haleakala, called Palaha;

15. Thence down Hana-Koolau boundary to initial point.

Approximate area, 14,825 acres.

The location and metes and bounds of each of the above named tracts are more particularly described by descriptions prepared by the Hawaiian Government Survey Department, numbered C. S. F. 1690, which said descriptions, now on file in the said Survey Department, are as follows:

Portion of Government land known as Hana Forest, Lease 492, and within the Hana Forest Reserve, Hana, Maui.

Beginning at Government Survey Trig. Station "Olopawa," thence running:

1. N. 57° 30' W. true 10,700 feet to top of Puu Hinai;

2. Thence southwesterly along boundary between Koolau and Hana districts to point on dividing ridge between said districts, distance about 19,000 feet;

3. Thence along said dividing ridge, general course and distance S. 76° 15' W. true 9,200 feet, to point on edge of great Kipahulu Valley, which point is distant 3,000 feet in a straight line from Government Survey Trig. Station at Wainapenape; thence

4. N. 89° 30' E. true 27,500 feet, a little more or less, to top of hill;

5. N. 55° 30' E. true 2,500 feet, a little more or less, to top of hill Koakea;

6. Thence along boundaries of Aleamai (L. C. A. 8660), Oloewa (L. C. A. 443), Grant 883 (G. P. Judd), Grant 3193 (Kakani, et al.), and Grant 3154 (Kahoomakaulii) to north angle of last named grant; thence

7. N. 61° 30' E. true 5,800 feet, a little more or less, to the initial point.

Area, 6,330 acres.

Compiled from C. S. F. Nos. 744 and 1690.

Portions of Government lands of Wakiu, Kawela-Kaeleku and East Honomaele, within the Hana Forest Reserve, and covered by Leases 518 and 474, Hana, Maui.

Beginning at Government Survey Trig. Station "Olopawa" and running:

1. N. $62^{\circ} 00'$ W. true 6,500 feet to gulch, the boundary between East and West Honomaele;
2. Thence northeasterly along said gulch to its intersection with the makai line of the Hana Forest Reserve, distance about 380 feet;
3. Thence along makai line of said Hana Forest Reserve in a southeasterly direction across the lands of E. Honomaele and Kawela-Kaeleku to a point on the shoulder of the hill called Olopawa, 1,000 feet northeast of the Government Survey Trig. Station "Olopawa," distance about 6,900 feet;
4. Thence still along the makai line of the Hana Forest Reserve in a southeasterly direction across the lands of Honokalani and Wakiu to the intersection of this line with the line of Wakiu Lease No. 518, distance about 860 feet; thence
5. Due west 1,400 feet, a little more or less, to the initial point.

Areas—

In Wakiu	3 acres
In Kawela-Kaeleku	65 acres
In E. Honomaele	15 acres
Total area	83 acres

Compiled from C. S. F. Nos. 224, 300 and 1690.

Government remainder of Koali-Puuhaao in Hana Forest Reserve, Hana, Maui, and covered by Lease 479 B.

Beginning at southwest corner of Grant 1165 to Bouillon, thence running:

1. Northwesterly in a straight line to summit of high peak "Kaumakanai";
2. Thence following down dividing ridge from this point to summit of conical hill "Hoolio" at head of land of Muolea;
3. Thence southeasterly along boundary of Muolea to the north angle of Grant 382 (Whittlesey);
4. Thence southwest along mauka boundary of this Grant 382 to the boundary of Crown land of Wailua;
5. Thence running mauka and around said land of Wailua and makai and along boundary of Puuhaoa and Wailua to north angle of Grant 1165 (Bouillon);
6. Thence southwest across head of last named grant to initial point.

Area 600 acres, more or less.

Copied from C. S. F. No. 583.

In Witness Whereof, I have hereunto set my hand and caused the seal of the Territory of Hawaii to be affixed.

Done at the Executive building, in Honolulu, this 12th day of June, A. D. 1907.

A. L. C. ATKINSON,
Acting Governor of Hawaii.

PROCLAMATION OF FOREST RESERVE IN THE DISTRICTS
OF NA PALI, KONA AND HALELEA, ISLAND OF KAUAI.

NA PALI - KONA FOREST RESERVE.

Under and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of Hawaii, enacted February 27, 1905, as amended by Act 65 of the Session Laws of 1905, enacted April 26, 1905, and by Act 4 of the Session Laws of 1907, enacted March 5, 1907, and of every other power me hereunto enabling, I, A. L. C. ATKINSON, Acting Governor of Hawaii, having held the hearing, of which notice had been duly given, as in said acts provided, do hereby approve as a Forest Re-

serve, to be called the "Na Pali-Kona Forest Reserve," those certain pieces of land in the Districts of Na Pali, Kona and Halelea, Island of Kauai, lying on the Waimea Upland, bounded on the south and west by a line drawn across the ahupuaas of Hanapepe, Makaweli and Waimea, between points on the main ridges where the general level of the upland breaks into the steep palis of the canyons, on the northwest by the palis of Na Pali District, on the north and east by the Districts of Halelea and Puna, and on the southeast by the land of Wahiawa, containing an approximate area of 60,540 acres, in the Districts of Na Pali, Kona and Halelea, Island of Kauai, Territory of Hawaii, more particularly described by and on maps made in December, 1906, by the Hawaiian Government Survey Department, which maps are now on file in the said Survey Department, marked "Registered Maps 2246 and 2375" and "Na Pali-Kona Forest Reserve, Kauai"; and a description accompanying the same, numbered C. S. F. 1757, which said description now on file in said Survey Department, is as follows:

NA PALI - KONA FOREST RESERVE.

Including the greater part of the District of Na Pali, a portion of the ahupuaa of Haena in the District of Halelea, and portions of the ahupuaas of Hanapepe, Makaweli and Waimea, in the District of Kona, Island of Kauai.

Beginning at Puuhinahina, a hill near the mauka end of the Kauhao paddock fence built by the Knudsen Brothers in 1898, as shown on Government Survey Registered Maps Nos. 2246 and 2375, and running as follows:

1. In a general westerly direction following along down the Kauhao paddock fence, distance about 11,160 feet, to a point on said fence at the edge of the pali;
2. Thence northerly across the Kauhao and Makaha ridges to "Makaha" Trig. Station, from which the true azimuth and distance to "Hanalei" Trig. Station is $2^{\circ} 22' 10''$, 18,781.5 feet;
3. Thence northerly across the Makaha Valley and the Milolii Ridge to the head of the waterfall in Paaki Valley;
4. Thence around the palis of the Milolii Valley to Anaki Peak, a prominent point on the edge of the pali;
5. Thence directly west down the pali to the foot of same;
6. Thence in a general northeasterly direction following the foot of the main palis around the valleys in the lands of Milolii and Nualolo and in the district of Na Pali to a point on the boundary between Na Pali and Halelea districts, said valleys being named as follows: Kaahole, Nualolo, Awaawapuhi, Honopu, Kalalau, Pohakuao, Waiolaa, Hanakoa, Wailaa, Waiahukua, Waiahukanaka, and Hanakapiai.
7. Thence easterly across the land of Haena in the district of Halelea, to a peak called Makana; thence to a peak called Pohakuakane; thence to a peak called Puunopili on the boundary between Haena and Wainiha. Excepting from this Reserve such parts of the valley of Haena and Manoa as the owners may see fit to retain for their own use.
8. Thence in a southerly direction along the main ridge dividing the lands of Haena and Wainiha to a point in said ridge on the makai boundary of the Halelea Forest Reserve, said point being 2,000 feet, more or less, makai of a prominent ridge running down into Wainiha Valley;
9. Thence in a southerly direction along the main ridge dividing the lands of Haena and Wainiha, being also the boundary of the Halelea Forest Reserve, to a point near Kilohana at the junction of the boundaries of the districts of Kona, Na Pali and Halelea;
10. Thence in a southeasterly direction along the main ridge dividing the Kona and Halelea districts to Mt. Waialeale, the junction of the boundaries of the districts of Kona, Halelea and Puna.
11. Thence in a southerly direction along the main ridge dividing

the Kona and Puna districts to a point called Kapalaoa on the boundary between Hanapepe and Wahiawa.

12. Thence in a southerly direction down the ridge dividing Koula (an ili of Hanapepe) and Wahiawa to a peak called Puu Aukai or Puuau, being near the end of the McBryde fence;

13. Thence in a northwesterly direction across the Koula and Manuahi Valleys to Peapea Peak on the boundary between Hanapepe and Makaweli;

Excepting from this Reserve such parts of the valleys of Koula and Manuahi as the owners may see fit to retain for their own use.

14. Thence in a northwesterly direction across the land of Makaweli across Kawaipapa and Kawai Valley to Kaupuaa Peak;

15. Thence in a northwesterly direction across the Olokele, Kahana and Mokoune Valleys to the Oopule Falls;

16. Thence in a northwesterly direction to a saddle in a ridge just mauka of Kaanakeakua;

17. Thence in a northwesterly direction across the head of Kaluakalani Valley over the Nakanakalolo Ridge to the falls in the Kahekaoe-lele Valley.

18. Thence following around the cliffs of Kalaukea Ridge to the Hihinui Falls in Opaewela Valley;

19. Thence in a northwesterly direction up to Kalehua-hakihaki on Kapukapaia Ridge, the boundary between Makaweli and Waimea, the true azimuth and distance from this point to "Puu Ka Pele" Trig. Station being: $109^{\circ} 12' 10''$, 21,831.7 feet;

Excepting from this Reserve such parts of the valleys of Olokele and Kahana as the owners may see fit to retain for their own use.

20. Thence in a northwesterly direction across Nawaimaka Valley to Kaaha Peak;

21. Thence in a northwesterly direction across Waialae Valley passing below the Kahumanono Falls to a prominent point on the Kaluahaulu Ridge above the head of the Oneopaewa Valley.

22. Thence in a northwesterly direction across Koiae Valley to Kahiliola Peak, the true azimuth and distance to "Puu Ka Pele" Trig. Station being: $69^{\circ} 38' 10''$, 8,266.0 feet;

Excepting from this Reserve that portion of the Koiae Valley below the foot of the cliffs and lying makai of the mouth of the Kipalau Valley, area 530 acres, more or less.

23. Thence in a northerly direction to the Awini Falls;

24. Thence in a northwesterly direction to a point known as Kaou on the Kumuwela Ridge, the true azimuth and distance to "Puu Ka Pele" Trig. Station being: $23^{\circ} 11' 10''$, 8,665.1 feet;

25. Thence in a northwesterly direction to the head of the Waipo'o Falls;

26. Thence in a northwesterly direction to the junction of the Halemanu and Nawaimaka Valleys.

27. Thence in a southwesterly direction to the point of beginning.

In Hanapepe (Ilis of Koula and Manuahi)	9,360 acres
In Makaweli	10,030 acres
In Waimea (Government land)	30,180 acres
In Na Pali (Government land)	10,470 acres
In Haena	500 acres

Total area 60,540 acres

And subject to the existing leases, as provided by law, I do hereby set apart as integral parts of the Na Pali - Kona Forest Reserve those portions of the government lands (more particularly described below) known as Waimea, Milolii, Na Pali (of which the unleased part is now actually and definitely set apart) and Hanakapiai that lie within the metes and bounds of the above described Na Pali - Kona Forest Reserve.

The location and metes and bounds of each of the above named tracts of Government land, so set apart, more particularly appear in descriptions prepared by the Hawaiian Government Survey Department, numbered C. S. F. 1757, which said descriptions, now on file in the said Survey Department, are as follows:

Portion of Government land of Waimea, District of Kona, within the Na Pali - Kona Forest Reserve, Kauai, and covered by Lease 112.

Beginning at Kalehua-hakihaki on Kapukapaia Ridge, the boundary between Makaweli and Waimea, the true azimuth and distance from this point to "Puu Ka Pele" Trig. Station being $109^{\circ} 12' 10''$, 21,831.7 feet, and running:

1. In a northwesterly direction across Nawaimaka Valley to Kaaha Peak;
 2. Thence in a northwesterly direction across Waialae Valley passing below Kahumanono Falls to a prominent point on the Kaluahaulu Ridge above the head of the Oneopaewa Valley;
 3. Thence in a northwesterly direction across Koiae Valley to Kahiliosa Peak, the true azimuth and distance to "Puu Ka Pele" Trig. Station being $69^{\circ} 38' 10''$, 8,266.0 feet;
 4. Thence in a northerly direction to the Awini Falls;
 5. Thence in a northwesterly direction to a point known as Kaou on the Kumuwela Ridge, the true azimuth and distance to "Puu Ka Pele" Trig. Station being $23^{\circ} 11' 16''$, 8,665.1 feet;
 6. Thence in a northwesterly direction to the head of the Waipo'o Falls;
 7. Thence in a northwesterly direction to the junction of the Halemanu and Nawaimaka Valleys;
 8. Thence in a southwesterly direction to Puuhinahina, a hill near the mauka end of the Kauhao paddock fence built by the Knudsen Brothers in 1898;
 9. Thence in a northeasterly direction along the edge of the pali overlooking the Halemanu Valley to Pohakuwaawaa, a hill on the ridge bounding the districts of Kona and Na Pali.
 10. Thence in a northeasterly direction along said ridge to Pihea, a prominent peak in the ridge;
 11. Thence in a southeasterly direction still along said ridge to a point near Kilohana at the junction of the boundaries of the districts of Kona, Na Pali and Halelea;
 12. Thence in a southeasterly direction along the main ridge dividing the Kona and Halelea districts to Kaoki, a prominent peak in said ridge;
 13. Thence in a southwesterly direction along the Kapukapaia Ridge, the boundary between Waimea and Makaweli, to the initial point.
- Excepting from this Reserve that portion of the Koiae Valley below the foot of the cliffs and lying makai of the mouth of the Kipalau Valley, area 530 acres, more or less.
- Area, 24,372 acres.
- Portion of the Government Ili of Milolii, in the ahupuaa of Waimea, District of Kona, within the Na Pali - Kona Forest Reserve, Kauai, and covered by Lease 164.
- Beginning at Puuhinahina, a hill near the mauka end of the Kauhao paddock fence built by the Knudsen Brothers in 1898, and running::
1. In a general westerly direction following along down the Kauhao paddock fence, distance about 11,160 feet, to point on said fence at the edge of the pali;
 2. Thence northerly across the Kauhao and Makaha Ridges to "Makaha" Trig. Station, from which the true azimuth and distance to "Hanalei" Trig. Station is $2^{\circ} 22' 10''$, 18,781.5 feet;
 3. Thence northerly across the Makaha Valley and the Milolii Ridge to the head of the waterfall in Paiaiki Valley;

4. Thence around the palis of the Milolii Valley to Anaki Peak, a prominent point on the edge of the pali;

5. Thence directly west down the pali to the foot of same;

6. Thence in a general northeasterly direction following the foot of the main palis around the valleys of Keahole and Nualolo in the land of Milolii to a point on the boundary between the Kona and the Na Pali districts;

7. Thence in a southeasterly direction along the ridge dividing the Kona and Na Pali districts to Pohakuwaawaa, a prominent peak in said ridge;

8. Thence in a southwesterly direction along the edge of the pali overlooking the Halemanu Valley to the initial point.

Area, 5,808 acres.

Portion of Government land in the district of Na Pali, within the Na Pali - Kona Forest Reserve, Kauai, not covered by lease.

Part I. Beginning at Pihea, a prominent peak on the main ridge bounding the districts of Kona and Na Pali, and running:

1. In a southwesterly direction along said main ridge to Pohakuwaawaa, a prominent peak in said ridge;

2. Thence in a northwesterly direction along said ridge to the foot of the main pali;

3. Thence in a general northeasterly direction following the foot of the main palis around the valleys in this section to a point on the northeast boundary of the land of Kalalau, said valleys being named as follows: Aawaapuhi, Honopu and Kalalau;

4. Thence in a southeasterly direction along the northeast boundary of Kalalau, along Lease 453, to the initial point.

Part II. All that portion of the district of Na Pali lying between the northeast boundary of the ahupuaa of Hanakapiai, Lease 345, and the southwest boundary of the ahupuaa of Haena, and bounded on the southeast by the main ridge dividing Haena and Wainiha and on the northwest by the foot of the main pali running along the coast of Na Pali.

Area of the two parts, 3,980 acres.

Portion of Government land in Na Pali within the Na Pali - Kona Forest Reserve, Kauai, and covered by Lease 453.

Beginning at Pihea, a prominent peak on the main ridge bounding the districts of Na Pali and Kona, and running:

1. In a northwesterly direction down the ridge along the northeast boundary of the land of Kalalau to the foot of the main pali;

2. Thence in a general northeasterly direction following the foot of the main palis around the valleys in this section to a point on the southwest boundary of the land of Hanakapiai, said valleys being named as follows: Pohakuao, Waiola, Hanakoa, Waialaa, Waiahuakua, Waiahukanaka;

3. Thence in a southeasterly direction along the ridge bounding the land of Hanakapiai to a point near Kilohana, at the junction of the districts of Kona, Na Pali and Halelea;

4. Thence in a northwesterly direction along the main ridge dividing the districts of Kona and Na Pali to the initial point.

Area, 6,360 acres.

That portion of the ahupuaa of Hanakapiai in the district of Na Pali, within the Na Pali - Kona Forest Reserve, Kauai, and covered by Lease 345, includes all of the land of Hanakapiai lying above and south of the foot of the main pali running along the coast of Na Pali, and contains an area of 130 acres, more or less.

In witness whereof, I have hereunto set my hand and caused the seal of the Territory of Hawaii to be affixed.

Done at the Executive building, in Honolulu, this 12th day of June, A. D. 1907.

A. L. C. ATKINSON,
Acting Governor of Hawaii.

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform Hawaiian readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

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REPORT ON THE GERMINATION OF THE SEEDS OF RUBBER PRODUCING PLANT.

By N. A. COBB.

Recently a number of instances of failure in the germination of rubber seeds have been called to my attention. These failures occurred in connection with plantations in various parts of the Islands. In some cases the seed was derived from foreign sources, in others the seed was grown in Hawai'i.

In one case seed obtained from Brazil gave germination results at .33 per cent. The seed appeared to be sound when opening and examining the cotyledons. These latter were white and were not in the least discolored. When the seeds were filed and placed in germination chambers, it swelled and for the most part appeared to make a proper start, that is, the point of the plumule appeared at the end of the seed. Soon, however, the plumule and the ends of the cotyledons next to it acquired a yellowish color and later on a fungus appeared, described by the manager as a mildew. At the time these seeds were received at my laboratory, a whitish color was apparent on the outside of the seed where it had been filed and covering most of the germination end of the seed. An examination of this mycelium showed that it had not yet formed spores. On being placed in the Petri dish with moist, sterilized blotting paper, the fungus fructified and proved to be *Mucor mucedo*, one of the most common moulds. This would indicate that the trouble was not one inherent in the seed, but one that had been introduced by the treatment. In moist conditions the seed may have been subjected to what would tend to bring about infestation by this almost omnipresent fungus. It may be that if the seeds were filed less it would be better as I observed that it is for the most part on the disclosed cotyledon that the fungus starts. If the mucor alone is to be blamed, then the difficulty is one that can be overcome by the observation of sterile conditions. Horse manure is particularly liable to growths of *Mucor mucedo*. When placed in a moist, warm place, horse manure almost always gives rise to a rich growth of this fungus.

From the appearance of the seed I suspected that it might have been derived in such a way as to have been subject to moist conditions or might possibly have been subjected to moist conditions in transit. I would suggest that rubber seed may be treated as an experiment with Bordeaux mixture preparatory to placing in the seed-bed, or with solution of formaldehyde. All the conditions concerning the process of germination should be sterile as far as possible, that is, the seed should be sterilized, the seed-bed should be sterilized, the files should be sterilized, the hands of the operators should be disinfected and the bags under the seed separating it from the horse manure used to assist in the germination should be soaked in Bordeaux mixture. Possibly artificial heat would be preferable to that obtained by the use of manure. Ordinary chicken incubators might, perhaps, be tried. The boxes used in the seed-bed should be sterilized with plenty of hot water. The soil in which the seeds are to become established, after starting to germinate, should also be sterilized. This may be accomplished by bringing the soil to the boiling heat in large kettles. Mix the soil with sufficient water to produce thin mud and bring it to a boil. Afterwards dry the mud in the sun.

LOCAL SEED.

In one instance where local seed was being tried a large percentage of the seed failed to germinate. This was brought about by the attacks of small earth worms in the soil in which the seeds were planted. The sterile conditions indicated above would prevent the attacks of these worms at least during the very early stages of the plant's existence.

All the worms of this class are sensitive to dryness. They are found only where the conditions are moist. Under such conditions, they are known to seriously injure crops of various kinds and they sometimes exist in the soil in phenomenal numbers, as many as 25,000 to 50,000 of them being found on one square yard of ground. Though they feed, for the most part, on decaying organic matter, some of them attack the soft underground parts of living plants, such as the rootlets, soft and succulent roots and underground portions of the stem. It is evident that germinating seeds would be particularly attractive to such species as attack living plants. I have had some experience with these worms in Australia and have found that they can be fought best by taking advantage of the weather. Such soils as contain these worms in injurious numbers should be worked actively during the dry weather. All the stages of the worms are injuriously affected by dryness. The adult worms and the egg-cocoons of the young worms all quickly die as soon as they are deprived of

moisture. This precaution is one that does not involve additional expense, at any rate in many cases; in fact, the treatment pays for itself, as the additional tillage is often precisely what the soil needs to make it more fertile.

I have also observed that these worms find the odor of tar to be objectionable and that tarring the seed will, to a certain extent, drive them away, more especially if there is something else in the soil upon which they can feed. I do not know whether rubber seed will be injured by tarring, but would suggest that it be tried. If, at the same time, some cheap seed could be planted alongside, not tarred, the worms would probably attack the shoots of these seeds. Almost any cheap seed that produces edible crops would answer the purpose; for example, wheat.

These worms sometimes cause serious trouble in green houses, where the amount of soil being used is not great. Under such circumstances it is possible to sterilize the soil by using steam or hot water.

If tobacco waste is boiled in water, two or three pounds of waste to the gallon of water, a liquor is produced which is fatal to many small organisms, among them these worms. I do not think that such a decoction would injure rubber seeds, but I have never tried it and can only suggest that this may be a suitable means of fighting the worms in the present case.

It would be best to avoid stable manure where these worms are abundant. It would be better to use artificial manure should any manure be required.

Of course the drainage should be attended to and good drainage provided. In preparing buds for seedlings, sometimes earth is brought from some supposed fertile spot and these worms may be introduced in this way.

Lime water is said to be injurious to these worms, but I have never tried it.

Those who are engaged in introducing rubber into these Islands, have at the present the opportunity which they will never again have. Where the plants are being introduced to new areas, it is possible, by taking certain precautions, precautions that are not expensive, to prevent or at least delay the introduction of the pests of the crop. If no precautions are taken, these pests are sure to make their appearance and to attain at no distant date whatever virulence they may have in their native country or they may even exceed that virulence. Once they have obtained such a footing, the present opportunity will be gone. It seems to me that there is no money that can be spent in connection with introducing a new crop to these Islands that is so well spent as in taking great care at the outset that no preventable diseases are introduced. The money spent so as to accomplish this end will be returned in the near future, perhaps a thousand fold.

AN IMPRESSION OF THE GOVERNMENT NURSERY.

In the February issue of *The Plant World*, a botanical magazine published at Denver, Colorado, Dr. Pehr Olsson-Seffer opened a series of articles entitled "Visits to Some Botanic Gardens Abroad" with the following paragraphs in regard to the Government Nursery, at Honolulu. Dr. Olsson-Seffer's account of his visit to Honolulu is reproduced here as being of interest to the readers of this magazine:

HONOLULU. Who ever heard of a botanic garden in Honolulu? There is no garden with that name, it is true, but so far as that goes, the entire city of Honolulu can be considered a botanic garden, and it will easily stand comparison with many in attempt at a botanical garden, with only the name to entitle it to such a rank.

The government nursery at the corner of King and Keeau-moku streets is a good nucleus to a botanic garden. A number of trees, indigenous and exotic, are planted here, every tree is labeled, and altogether it is a creditable little arboretum. In one corner of the block is the building of the Territorial Board of Commissioners of Agriculture and Forestry, in which are the offices of the divisions of forestry, entomology and animal industry, as well as an excellent little library of reference books on botany and forestry, with the current periodicals of these sciences.

The grounds are under the direction of Mr. Ralph S. Hosmer, the Superintendent of Forestry, formerly of U. S. Department of Agriculture.

I visited the grounds almost daily for several weeks, and inspected the nurseries with Mr. Hosmer and his assistant, Mr. David Haughs. There are in the grounds fine specimens of the native screw palm, or "Hala" (*Pandanus odoratissimus*), of *Sabal blackburniana*, a fan palm, of *Calophyllum calaba*, the calaba tree. *Nephelium litchi*, which produces the leechee or litchi fruit, a special favorite with the Chinese, but becoming more and more appreciated by Americans, is represented by a large specimen, and *Cinnamomum cassia*, the "Lignum vitae" of Southern China, grows equally well.

Everywhere in Honolulu the Royal Palm (*Oreodoxa regia*) is used in forming avenues, and gives a distinct character to the place. *Caryota urens*, *Areca rubra*, the Oil Palm (*Elaeis guineensis*), and *Thrinax argentea* are commonly cultivated plants here. The Royal Poinciana (*P. regia*), the Cassias (*C. fistula*, *C. grandis*, and *C. nodosa*), *Durantas*, *Caesalpinias* and the Pride of India (*Melia azedarach*), give color to the tropical green, while introduced Casuarinas, Eucalypts, and Grevilleas intermingle in the parks and on the planted hill-sides with the native Ohia Lehua (*Metrosideros polymorpha*), Koa (*Acacia koa*), and sundry other indigenous trees.

Along the seashore and in its immediate neighborhood are numerous groves of coconut palms, and in most gardens sundry tropical fruit trees, such as *Carica papaya*, *Mangifera indica*, and *Persea gratissima* are common. The "Night Blooming Cereus" covers many stone walls in the city, and when in bloom is a remarkable sight.

Hawaii is an Eldorado for the botanist who has never been to the tropics. It is within easy reach of the Pacific Coast, and there is no place better suited for a pleasant vacation than these islands with their almost tropical flora, where the climate is agreeable, the living comfortable, and traveling easy.

Four weeks spent in the islands in 1902, and four weeks in 1906, made me love "Hawaii nei," "Happy Hawaii," as the natives call their kingdom of the sea, with its fair skies and blue ocean, its bright flowers and its verdant green, its droning palms, and its ragged volcanoes, its drowsy tropical atmosphere, and its brilliant sunsets, surpassed by none in my experience but those of Samoa, the most beautiful islands of the Pacific.

**BOARD OF AGRICULTURE AND FORESTRY.
DIVISION OF FORESTRY.**

ROUTINE REPORTS.

May 15, 1907.

Board of Commissioners of
Agriculture and Forestry,
Honolulu.

Gentlemen: I have the honor to submit the routine report of the Division of Forestry for the fortnight.

During this time I have been in Honolulu engaged with various routine duties in connection with work of the Division of Forestry and with preparations for contemplated trips to the other islands, having to do with forest reserve matters.

The Governor has set the date of the public hearing for the consideration of the proposed Na Pali-Kona Forest Reserve on Kauai as Monday, May 27th. At the same time there will be considered the recommendations of the Board regarding the increase in area of government lands actually set apart in the Hana and the Koolau Forest Reserves on Maui.

Mr. Haugs has completed a report and planting plan for a part of the land of Wahiawa within the Ewa Forest Reserve. This report was prepared at the request of the Wahiawa Water Company.

On Tuesday evening, May 14th, the library room of the Board was used for a meeting of the Hawaiian Poultry Association.

The work in the Nursery and at the Nuuanu Forest Station has gone on as usual during the fortnight.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

July 29, 1907.

Board of Commissioners of
Agriculture and Forestry,
Honolulu.

Gentlemen: I have the honor to submit the following report covering the routine work of the Division of Forestry from May 15, 1907, to date.

During this period my own time has been taken up as follows: From May 14 to May 25 I was on Maui, making a trip around the West Maui mountain, in company with Mr. S. M. Kanakanui of the Survey Office, establishing points on the boundary of the proposed forest reserve in that section. Mr. Kanakanui spent the greater part of June and part of July in locating and marking the points selected. As soon as the technical description is received from the surveyor a report on this project will be submitted to the Board.

On May 28 and 29, in company with Mr. H. M. von Holt, and Mr. O. L. Sorenson, of the Survey Office, I visited the land of Honouliuli on this island to fix the points on the proposed forest reserve on the Waianae Mountains where the boundary crosses this land. Mr. Sorenson later located these points. The matter will be reported on to the Board in the near future.

During the first part of June I was in Honolulu engaging with various routine matters incident to the Na Pali-Kona (Kauai) and Koolau (Maui) Forest Reserves, to the completion of a list of foreign seed exchanges, to matters connected with the close of the biennial fiscal period and with other details connected with the regular work of the Division.

From June 18 to July 3 I was on the Island of Hawaii engaged: (1) in an inspection of the work of the Hawaiian Mahogany Lumber Company, undertaken at the request of the Trustees of the Bishop Estate, under the offer of assistance contained in Circular No. 1 of this Division. This examination had been projected for some time and had more than once been unavoidably postponed. (2) In an examination of the land of Piihonua, made at the request of the Commissioner of Public Lands.

Since my return to Honolulu I have been engaged in the preparation of reports on various forest reserves and other projects

and with routine and other matters connected with the Division of Forestry.

On May 27 a public hearing was held to consider the creation of the Na Pali-Kona Forest Reserve on Kauai and the setting apart of additional government lands on the forest reserves on Maui. On June 12 Acting Governor Atkinson signed proclamations carrying these projects into effect.

At the Nursery considerable work has been done during the last two months toward bettering the condition of the grounds by curbing the walks and driveways and filling them with coral rock to conform to grade. When completed the grounds will be greatly improved. The larger part of the cost of these improvements is borne by the Department of Public Works from its appropriation for public grounds.

The regular work at the Nursery has gone on as usual; the most important features are the distribution of samples of Hawaiian grown seed to over one hundred foreign Botanic Gardens and similar institutions in different parts of the world; the local distribution of plants of the Central American rubber (*Castilla lactiflora*), better known under the old name of *Castilloa elastica*; and several applications for planting plans for forest plantations.

A grass fire in Nuuau Valley on Sunday, June 30, was extinguished by the Deputy Fire Warden for Nuuau Valley, Mr. G. H. Moore, before it did much damage. As a consequence of this fire an extension telephone bell has been put in at the Nursery, so that now some one of the employees of the Division can always be reached by telephone, day or night. The number is White 1991.

During June the various district foresters on the several islands were commissioned by the High Sheriff as special territorial police officers to enforce the new Bird Law (Act 104 of the Session Laws of 1907).

Miss Melika Peterson, the clerk of the Board, was absent from Honolulu on a vacation from June 12 to the end of that month.

The library room has been used during the period covered by this report as follows:

Hawaiian Entomological Society, June 6.

Hawaiian Poultry Association, June 12.

Hawaiian Poultry Association, July 10.

RALPH S. HOSMER,
Superintendent of Forestry.

Notes From the Reports of the Forest Nurseryman.

(June 28, July 17 and 29, 1907.)

Central American rubber plants (*Castilla lactiflora*), with circular letters, have been sent to over forty people in different parts of

the islands who are supposed to report from time to time on the growth and condition of the same.

Sample packages of seeds have been sent to ninety-six botanic gardens and other institutions in different parts of the world. Between forty and fifty packages were sent to each institution containing as many varieties of island grown seed.

FIRE IN NUUANU VALLEY.

On June 30th, at about 11:30 a. m., a fire broke out in the upper part of Nuuau Valley. The fire burned over about 15 acres, the material burned being principally Hilo grass and staghorn ferns. Mr. G. H. Moore, Deputy Fire Warden for Nuuau Valley, with his daughter and one laborer worked for five and a half hours fighting the fire, which they succeeded in putting out about half past five in the afternoon. The damage done was very slight. The fire was on the Waikiki side of the valley opposite the forest station.

SEED COLLECTING.

The collecting of seed has been continued and all around the city and the different valleys are being searched. Half a pound of camphor and a quarter pound of loquat seed have been received from the Yokohama Nursery Company in exchange for seeds sent from here. Three pounds of Japanese larch (*Larix leptolepis*) and five pounds cedar (*Cryptomeria japonica*), which were ordered sometime ago, have also been received.

There is no doubt a great many plants, new to the Territory, will be introduced through the exchange of seeds. We have already propagated a number of valuable plants from seeds received in this manner. Seeds have been received from the following:

Department of Lands, Sydney, 30 packages.

Public Gardens and Plantations, Jamaica, 13 packages.

The seed ordered sometime ago from the Union Nursery, Darbhanga, British India, consisting of 70 packages, has been received.

ADVICE AND ASSISTANCE.

Mr. Wm. Weinrich, manager of Sisal Plantation, has given notice that he will make application for advice and assistance in the planting of trees on lands lately acquired by his company, at Wahiawa, Oahu.

A commencement has been made in the planting of trees on land lately acquired by Mr. C. Wight and examined by the writer a short time ago. The land mentioned is on the Waikiki side of Nuuau Valley, just opposite Mr. Wight's residence.

An applicaton for advice and assistance has been received from Major S. W. Dunning, commanding Fort Shafter. Major Dunning is anxious to begin the beautifying of his new post and has asked the assistance of this Division in the matter. Arrangements have been made for the writer to visit the post where he will meet Major Dunning and go over the ground with him.

MAKAWAO FOREST RESERVE—MAUI.

At the meeting held on July 29, 1907, the Board of Agriculture and Forestry approved the project to extend the area of the Koolau (Maui) Forest Reserve by the creation of an additional reserve of 1796 acres to be known as the Makawao Forest Reserve.

The section included is a part of the government land of Makawao, some times called the Haleakala Tract, lying on the northwestern slope of Mount Haleakala. It has always been under a forest cover, its western limit, the Kahakapao Gulch, having for many years been the dividing line between forest and grazing land. The land is unleased and can be definitely set apart at once.

In accordance with the usual custom there are published herewith the reports of the Committee on Forestry and of the Superintendent of Forestry upon the proposed reserve, with the resolution adopted by the Board in regard thereto.

RESOLUTION RELATING TO THE PROPOSED MAKAWAO FOREST RESERVE.

Resolved, that that certain land in the District of Hamakua-poko, Island of Maui, bounded in general terms as follows:

Lying on the northwestern slope of Mt. Haleakala, bounded on the north and east by the Koolau Forest Reserve, on the south by the land of Kalialinui, and on the west and northwest by the remainder of the land of Makawao, and containing an area of 1796 acres, more or less, as recommended in a report of the Committee on Forestry, dated July 29, 1907, based on report of the Superintendent of Forestry, dated July 27, 1907, which reports are on file in the office of the Board of Agriculture and Forestry; the boundaries of which proposed reservation more particularly appear by and on a map made in May, 1907, by the Hawaiian Government Survey Department, which said map is now on file in the said Survey Department, marked "Registered Map No. 2394," and "Makawao Forest Reserve, Maui;" and a description accompanying the same, numbered C. S. F. 1792, which said description is now on file in the said Survey Department; copies of which said map and description are now on file in the office of this Board and made a part hereof; be approved as a forest reserve to be called the Makawao Forest Reserve.

Resolved, that the Board recommends to the Governor that the government lands lying within the boundaries of the said proposed Makawao Forest Reserve be set apart by him, subject to vested rights therein, after the hearing required by law, as the Makawao Forest Reserve.

Adopted at a meeting of the Board of Agriculture and Forestry held on July 29, 1907.

REPORT OF THE COMMITTEE ON FORESTRY.

Honolulu, Hawaii, July 29, 1907.

To the Commissioners of the
Board of Agriculture and Forestry,
Honolulu.

Gentlemen: Your Committee on Forestry have had under consideration the report of the Superintendent of Forestry on the proposed extension of the Koolau, Maui, Forest Reserve, consisting of a part of the land of Makawao.

The propriety of including this in the general forest system of Koolau was considered and passed on favorably by your Committee on the 14th day of December, 1904. There is no question in the mind of your Committee that the tract under consideration should be declared a forest reserve. Your Committee, therefore, recommend the adoption of the report of the Superintendent of Forestry, and that appropriate resolutions be adopted recommending the setting apart of the above mentioned tract as a forest reservation, and that the Governor be notified of the action of the Board and requested to act thereon, as by law provided.

Respectfully submitted,

ALFRED W. CARTER,

C. S. HOLLOWAY,

Committee on Forestry.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

Honolulu, Hawaii, July 27, 1907.

Committee on Forestry,
Board of Agriculture and Forestry,
Honolulu.

Gentlemen: I have the honor to submit a report with recommendations on a proposed extension of the Koolau (Maui) Forest Reserve, by the creation of a small additional reserve to be called the Makawao Forest Reserve.

LOCATION.

The area in question is that portion of the government land of Makawao, sometimes called the Haleakala Tract, in the District of Hamakuapoko, Island of Maui, to the east of the Kahakapao Gulch and between the Falls of Pali o ka Moa and the hill known as Puu Kakae. The tract may be roughly described as lying on the northwestern slope of Mt. Haleakala, bounded on the north and east by the Koolau Forest Reserve, on the south by the land of Kalialinui and on the west and northwest by the remainder of the land of Makawao, and containing 1796 acres.

DESCRIPTION.

Makawao is a government land. In December, 1874, it was leased to the Board of Education for a nominal sum, and soon after subleased by that department at a fair rental for the remainder of the term. The lease, which was held of late years by the Haleakala Ranch Company, expired on March 26, 1904, since then the land has continued to be used by the ranch under a tenancy at will. The land is therefore not now under lease.

The control of Makawao by the Board of Education explains the reason for the words "Board of Education" that appear across the land on the government map of Maui.

The question of the reservation of this part of Makawao has already received favorable consideration from the Board, in connection with a proposal made in November, 1904, by the Haleakala Ranch Company to exchange certain adjoining forest lands for the remainder of Makawao, whereby those lands and the portion of Makawao now under consideration were to be made a forest reserve. I submitted a report at the time which is now on file in the office of the Board. The proposed exchange was not approved by the Governor. Consequently the matter was dropped. Later when the question of setting apart the forested portion of Makawao again came up it was decided to wait until an accurate description of the boundary could be had. Such a description is now in hand and forms a part of this report.

OBJECT.

The objects of the proposed Makawao Forest Reserve are to afford permanent protection to the forest cover on the water sheds of the streams rising within its limits and to extend to its natural western boundary the forest area in part protected by the existing Koolau Forest Reserve. The arguments made for the creation of the Koolau reserve are equally applicable, so far as its area goes, to the tract now proposed to be set apart. These have already been set forth at length in my report on the Koolau Reserve and need not be repeated here as that report, made under the date

of July 28, 1905, was published in the Hawaiian Forester and Agriculturist for August, 1905, Vol. II, pp. 234-240.

THE FOREST.

The forest on the portion of Makawao now proposed to be set apart as a forest reserve, is the western end of the great Koolau forest that covers all the northern side of Mt. Haleakala. It is of the same character as that further to the east, being made up chiefly of Ohia Lehua and Koa. The area is drained by the gulches that make up the Waiahwi Stream, which is one of the principal tributaries of the Maliko Gulch. These streams, although intermittent, are of value in connection with the other streams on the windward side of Maui.

The Kahakapao Gulch is the natural western boundary of the Koolau forest. Not only has it for many years been the dividing line between forest and grazing land, but it is also practically at the point where the area of heavy precipitation gives place to the drier climate of the Kula District. The reason for this change of meteorological condition is due to topography. Makawao lies on the shoulder of the mountain. The open lands beyond are subject to different wind currents from those under forest to the eastward.

PRIVATE RESERVE.

For the past ten years the proposed reserve has been treated as a private forest reserve by the Haleakala Ranch Company, which at its own expense has built and maintained fences to keep out the cattle. The gulch itself is a barrier part of the way but at both the upper and lower ends of the reserve fences are necessary. It may be said in passing that within the last two years the Haleakala Ranch Company has also fenced in and now maintains as a private forest reserve portions of its fee simple land of Kalialinui. The official recognition of this private forest reserve will be considered with other forest questions on Maui in a future report.

RECOMMENDATION.

For the reasons above set forth I now recommend that the Board request the Governor to set apart and create as the Makawao Forest Reserve the area within the boundary hereinafter technically described, in accordance with law, after the hearing required by statute.

DESCRIPTION.

[Here follows in the original a technical description of the Reserve boundary, prepared by the Survey Department. It is here

omitted as it also forms a part of the official proclamation, that will be published in full later, when the land has been set apart.]

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

NOTES.

The Japanese Rice Refining Company has declared a semi-annual dividend at the rate of 15 per cent. per annum. Its net profits for the year amounted to \$9,463.81.

The reputation of the Hawaiian pineapple is extending beyond the mainland and a demand for it is said to have arisen in London and Paris. From the latter city one of the largest importers of canned fruits in France, is seeking to establish business relation with Hawaiian canners.

A company has recently been organized to engage in the production of copra in the Koolau district. Although the coconut does not reach perfection in these islands there is every prospect of the industry being successful here, as it will be conducted on land of little other agricultural value.

The Kona Vineyards Company, Limited, has filed its charter with the Territorial Treasurer. The main purpose of the company is wine growing in Kona, Hawaii. Its present capital is \$50,000, with the privilege of increasing to \$1,000,000. This is the second wine making company to incorporate in the Territory, the first one being in operation on Maui.

The Kaupakalua Wine & Liquor Company, of Maui, will produce twelve thousand gallons of wine this season. The area of available land throughout the islands suitable for the cultivation of the grape is enormous and the success of the local vineeries should encourage the wide extension of the manufacture of wine within the next few years.

Mr. J. E. Higgins, horticulturist of the Hawaii Experiment Station, has gone to the Coast with a consignment of fifteen tons of island fruit, consisting of pineapples, avocado pears, bananas and papayas, in order to market them as far East as Chicago, with a view to popularising them on the mainland. This is the second experimental shipment conducted on a large scale by the Station, which hopes by this means to create a regular demand for Hawaiian fruits in markets hitherto looked upon as inaccessible to our growers.

IMPROVING HAWAIIAN PASTURES.

By G. C. MUNRO.

In August, 1899, when I took over the management of the Molokai Ranch, there was evident necessity for improvement in the pastures on the extent of semi-arid and partially denuded land on the estate. The various boards of directors, under whom I served, aided and encouraged me in every way in the work of introducing and experimenting with foreign grasses and forage plants to assist in this object.

It has therefore been my privilege to make some of the first growing trials here and to have made the first practical demonstration of some grasses which I feel sure will eventually revolutionize the stock raising industry of the Islands.

The plan followed in the first trials was this, to procure seed in small quantities of any grasses that might seem suitable. A small amount of each was sowed in the garden and tended, the rest being mixed and sown broadcast over as great an area and under as many varying conditions of locality and soil as possible. The garden plots were tested for drought-resisting qualities, and were a guide to the identification of the grasses in the open. The broadcast sowing was a test for self-spreading and general adaptability to local conditions, for it is necessary for a good range grass, especially in dry country, that when established it will seed quickly and plentifully and spread without much artificial help. When once a grass showed itself worthy of propagation, and was found to thrive in the open, seed was bought in larger quantities, and in some cases land was plowed and prepared for the seed.

In carrying out the initial experiments in this way the expense was very light, though there was a considerable amount of clerical and inspection work necessary.

That the improving and maintaining of the pastures is one of the main points in stockraising is undoubted, and worthy of much more attention and expenditure than is at present given it here. Thousands of acres of what is now almost useless land could be brought into use, and a rotation of useful feed crops could be grown on resting cane land which would more quickly bring back those constituents of which the cane has deprived it of than is achieved by weeds which now accomplish this object. The expenditure in fertilizers would also be reduced.

A system of dry farming is drawing much attention at present and gives wonderful results in dry country. But few countries can depend for any lengthened time on natural pastures, it being found profitable eventually to improve on natural conditions, to grow better grasses, to cure hay and ensilage for use in seasons and periods of scarcity, and also to grow fodder catch-crops.

This is a feature in the agriculture of parts of the United States, Australia and the Argentine Republic, and nothing impressed me more in my recent visit to New Zealand than the improvement in the pastures, principally from adopting improved methods.

By growing paddocks of suitable grasses and keeping them for seed for distribution over the ranch, is perhaps the best method to follow on these Islands. A great deal can be done by simply gathering the ripened seed heads and scattering them over the pastures, or by turning the stock in when the seed is ripening and then distributing the animals over the land to be seeded. This latter is an old and somewhat rough method, but it is inexpensive and very effective in some cases; some seeds such as those of *Paspalum dilatatum* are improved in germinating quality by passing through the animals. Another method is to fence in long narrow paddocks across the wind and to plant them with the grass which it is desired to introduce.

Seed will also be distributed by allowing hay to ripen to some extent before cutting; the eventual feeding of the hay will spread the seed. Sufficient resting spells should be given any pasture at suitable times, as nothing runs a pasture out, and especially a dry pasture, so quickly as continuous stocking with the same class of animals. For their favorite food plants being kept continuously eaten down, and not allowed to seed, are eventually killed. The ground is also in the meantime gradually taken up with less desirable plants. A rotation of different kinds of stock, with intervening rests, is beneficial not only to the pastures, but has a direct influence on the health and condition of the stock and on the reduction of their parasites. In fact the success of stock raising for profit probably hangs more on the care and judgment given to this than anything else, for no matter how well bred one's stock may be, unless it be properly fed and kept in good health, it will not bring full profit.

On the Molokai Ranch I found that by resting the pastures, grasses almost killed out came gradually back, and the feed was much improved. Of course on all ranches this could not be followed. At first there was great difficulty in getting information on drought-resisting grasses. Then the bulletins of the Department of Agriculture were consulted, and later other publications treating on this subject, principally the Australian Government publications, for the same problem has been confronting several countries in the last number of years. Another difficulty was to get seed, most of the plants we desired to try not being in cultivation and the seed not in the market.

The opening of the United States Experiment Station under Mr. Jared G. Smith, who has wide experience in pasture grasses and in investigating the problem of regrassing denuded arid range country, helped us in this, and brought additional opportunities to the Hawaiian stock raisers. Mr. Smith has taken much inter-

est in the work and has been instrumental in introducing the seeds of a great number of grasses and fodder plants for trial under dry conditions. Many of these will no doubt eventually prove valuable.

The first lot of seed was received from him in 1903 and sowed early that year and though nearly all grew and many seeded, yet few gave promise of being permanent grasses.

Andropogon saccharoides, feather sedge grass, seeded and spread to some extent, and subsequent lots of seed received under the name of "fuzzy top," the same grass or a variety of the species, gave greater promise. The latter seeded well and lived through the droughts. It is growing very strongly this year, and will, I think, be a valuable addition to the dry land grasses.

Sporobolus wrightii showed remarkable drought-resisting qualities and grew from scattered seed on the salty land. It also grew on the higher dry country, but did not make much growth. Others that have shown well are as follows: *Bouteloua curtipendula*, side oats, or tall grama, is the best of the gramas and did well from scattered seed. It grows well and seeds on pretty dry country. *Bouteloua hirsuta*, black grama, did well in the garden and yet may show in the open.

Sporobolus cryptandous did well in the garden and will, I think, yet make a showing in the pastures, as it seems very hardy and seeds freely with little moisture. *Mulenbergia petrei*, *Hilaria mutica*, *Panicum bulbosum*, sand lucerne and Turkestan alfalfa are other drought-resisters. The above are all perennials.

A number of annuals were tried, grasses, beans, and saltbushes. Of the two former there were no results of any note. Each seeded one season and did not show any more.

Of the many saltbushes tried, *Atriplex nuttalii*, Arizona salt bush, was one that gave much promise. This saltbush sown in 1904 took well on the salty seaside land, was eaten down to the ground by the cattle in the dry season. In the next dry season, some of it in the mean time being fenced from the stock, grew in a dense bush up to about five feet high and proved very succulent and seeded heavily. The bushes outside the fence were again eaten to the ground, and some of them killed outright so that it would seem probable that this plant could be best used in conjunction with the kiawe bean, by growing it in fenced paddocks and not feeding it too closely. It is evidently a valuable plant for the shore line and should be fully tested. Anything that will furnish a roughage in feed, even if not very nutritious, will be valuable in the kiawe belt. Often so little rain falls on the adjacent lands that little grows there and the stock has no change from the beans except the sea side weed, which is not relished by the stock. *Atriplex semibaccata*, Australian salt bush, was one of the first plants I tried, getting some seed from some growing as a pot plant at the residence of a resident at Kaunakakai in 1899. I had seen it planted some years before by Messrs. Gay

& Robinson on the Makaweli Ranch, the seed being procured from Mokuleia Ranch, where it was then growing, introduced probably from Australia by the late Mr. Tom Gay, then manager of that ranch.

I procured a few pounds of seed from California and in the wet season of 1900 and 1901 spread it over the ranch. It is now well established in several places on the dry salty land along the coast, though it may to some extent be eventually choked out by the kiawe forest. It grows through the driest weather, furnishing some feed in the dry months and ripens a great amount of seed which is spread over the surface by the stock and the rains, and grow freely. It only succeeded well on Molokai near the sea. In Australia it is a valuable sheep feed and is a great deterrent of worms in sheep and lambs. It should be planted on any sheep ranches with salty land. The seed need only be strewn on the bare surface during the dry season.

Paspalum dilatatum: This grass is, I think, worthy of first place. Though not the best drought-resister, it combines many essential qualities needed for this country. My attention was first drawn to it by mention in a New Zealand paper, and I tried it in the latter part of 1903. I believe Mr. F. G. Krauss, instructor of agriculture at Kamehameha School, also made successful experiments with it in the same year. It has shown itself so well adapted to the ranch that nearly 2,000 pounds of seed were imported and sown in the last two years. Its advantages are these: It is a very strong quick-growing grass in the warm months with a reasonable amount of moisture. It is a heavy seeder and provides a tremendous amount of feed which is relished by horses, sheep, cattle and hogs. It is good for milk production and for fattening, and will stand any amount of stocking when growing. In fact it cannot be eaten too closely at that time. It will stand as much and perhaps more drought than *manienie*, and though it is credited with taking up the land to the exclusion of other grasses, this will not likely happen here, as on the dry country it will no doubt be killed back to some extent in the dry seasons. On the moister lands it will be some time in overcoming such grasses as *manienie* and *buffalo grass*, and others less desirable, and even if it takes up the middle country it will be more of an advantage than anything else. Clovers, however, grow well with it, which should enhance its value as a fattening feed. The seed of *Paspalum dilatatum* does not germinate readily, and requires a certain amount of shade and a continued term of moisture, so that it can with advantage be sown amongst other grasses. The seed will not start till the requisite amount of rain has fallen to insure the growth of the seedlings. If summer showers start the easily germinating seed, the plants die if the weather continues dry. After sowing there may be little sign of the grass for a year or more.

Paspalum dilatatum is a heat lover and grows most rapidly under conditions of heat, provided it has moisture. It will thrive at the frost line, but makes very little growth there in the cold months. This, however, is not much of a detriment as during these months feed is usually most luxuriant on the lower country, and it comes in the hotter and drier months when the annual grasses are dead and most perennials are growing but little. It will be of especial value on ranches with a large proportion of dry country, as a stand-by for the dry season on the middle lands, much of which at present under pilipiliula and other inferior grasses. These carry but a small proportion of stock to what they would do under *Paspalum dilatatum*. I have planted roots of this grass amongst thick pilipiliula and it has steadily gained ground. When growing amongst thick manenie I have run a fire through the latter and though the paspalum was scorched by the fire, in a few days it had sent out fresh shoots several inches long, before the manenie had got a start. The greatest drawback with it is the difficulty in collecting the seed, as the seed even on individual seed heads ripens unevenly. To collect good seed it is best to shake the seed heads over a flat pan. This should be repeated at intervals whilst the season lasts.

Ranchers are sometimes disappointed at the non-appearance of plants after sowing. This may, of course, be due to bad seed, but may be that the conditions have not been favorable to its germination. With altered conditions it may later on show up. Again roots may be planted in the wet and coldest months and very little growth be apparent for some time, but as soon as the warm weather sets in it will grow luxuriantly.

On account of being unable to harvest seed with a high percentage of germinating quality by machinery, the seed from Australia where the price of labor is higher than here, is necessarily high, and the best plan would be for the ranchers here to raise their own seed, taking care that the seed paddock is situated where it will get rain during the warmer months, when a maximum amount of seed can be gathered.

On the Molokai Ranch, at an elevation of about 1,000 feet, it seeds twice in the year, in the earlier and later months of the wet season. Between 800 and 1,200 feet is, I think, the best location to establish it. Planting the roots was originally practiced, but I think the best plan is to sow the seed broadcast over the pastures where the other grasses do not completely cover the ground. Once established in a locality I believe that periodical burning of the thick manenie will bring it in over the areas covered with this grass, as the stock will distribute the seed of the paspalum, which will come up amongst the annual grasses that follow these fires.

Whether the fire would have this effect on the pilipiliula land I do not know, and perhaps plowing would be necessary where it is very thick. When lands covered with pilipiliula at an eleva-

tion of about 1,000 feet and above this to the frost line, are taken up by paspalum dilatatum, it will be a great stand-by in the dry season, and even as fattening pastures.

Paspalum dilatatum is a native of South America and its value as a pasture grass has been demonstrated in Australia where it was introduced about 30 years ago. Of late years it has revolutionized the dairying industry of some of the States of the Commonwealth. *Paspalum virgatum* is attracting notice in Australia, I tried it, but had no success, probably from bad seed.

THE IMPORTANCE OF THE FOREST.

"The forest and water problems are perhaps the most vital internal question of the United States."—President Roosevelt.

"Of the wheels of public service that turn under the Indian Government there is none more important than the Department of Woods and Forests."—Kipling.

"How foolishly men destroy the forest cover without any regard for consequences, for thereby they rob themselves of wood and water."—Humbolt.

"Agriculture is a profession and occupation which a man may spend a lifetime and at the end say in all sincerity that he has still got far more to learn than he knows. It is only the ignorant who have nothing more to learn."—*Journal of the Jamaica Agricultural Society*.

(To be continued.)

BY AUTHORITY.

Notice is hereby given that W. M. Templeton, Esq., has been appointed District Fire Warden in and for the District of Waialua, Island of Oahu.

Notice is hereby given that W. W. Goodale, Esq., has been appointed District Forester in and for the District of Waialua, Island of Oahu.

Honolulu, T. H., August 7, 1907.

Notice is hereby given that August Ahrens, Esq., has been appointed District Forester for that portion of the District of Hamakua, from and including the Waimanu Valley to the District of Hilo; and District Fire Warden for the western part of the District of Hamakua, extending as far as the west boundary of the land of Paauhau, Island of Hawaii.

C. S. HOLLOWAY,

President and Executive Officer Board of Agriculture and Forestry.

Honolulu, T. H., August 12, 1907.

DIVISION OF FORESTRY.

THE PIIHONUA FOREST.

On June 17, 1907, the Commissioner of Public Lands submitted to the Board of Agriculture and Forestry a request for information on an application for lumbering rights on the land of Piihonua, Hilo, Hawaii.

Approving the recommendations of the Superintendent of Forestry and the Committee on Forestry, the Board submitted to the Governor the recommendation that no lumbering be permitted on this land. Governor Carter sustained this action by refusing to grant the desired license.

Following are the reports of the Committee on Forestry and of the Superintendent of Forestry, approved by the Board, in regard thereto.

The recommendations made in these reports are significant as they more strictly define the policy of the Board in regard to lumbering than does any action heretofore taken. What is now approved is, however, quite in line with action previously taken by the Board, as may be seen by reference to an article entitled "The Policy of the Board in regard to Lumbering" that appeared in the Hawaiian Forester and Agriculturist for November, 1906, Vol. III, No. 11, pp. 368-373. In this connection special attention is called to the last paragraph of the report of the Superintendent of Forestry that forms a part of that article.

ACTION BY THE BOARD.

Extracts from the minutes of the Board of Commissioners of Agriculture and Forestry. Meeting of July 29, 1907.

Moved and seconded that the report of the Forestry Committee relative to the suggested lumbering of Piihonua be adopted. Carried.

REPORT OF THE COMMITTEE ON FORESTRY.

Honolulu, Hawaii, July 29, 1907.

To the Commissioners of the
Board of Agriculture and Forestry,
Honolulu.

Gentlemen: Your Committee on Forestry has had under consideration the report of the Superintendent of Forestry, on the question submitted to this Board by the Land Commissioner of permitting lumbering on a part of the land of Piihonua, in the District of Hilo.

Your Committee has carefully considered this report and the reasons given by the Superintendent of Forestry for his recom-

mendation against lumbering the tract mentioned. The reasons set out in the report appear to your Committee to be sound, and should be followed by this Board.

After a careful consideration of the matter your Committee recommends that the report be adopted.

Respectfully submitted,

ALFRED W. CARTER,

C. S. HOLLOWAY,

Committee on Forestry.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

Honolulu, Hawaii, July 18, 1907.

Committee on Forestry,
Board of Agriculture and Forestry,
Honolulu.

Gentlemen: I have the honor to submit the following report on the question of permitting lumbering on the land of Piihonua, District of Hilo, Island of Hawaii:

This report is made in reply to a request received from the Commissioner of Public Lands on June 18, 1907. It is based: (1) on an examination of the land made at the end of June, 1907, during which I saw as much of Piilhonua as can be seen without the cutting of a considerable number of trails through heavy undergrowth and across swamps; (2) on all the other evidence in regard to the character of the land that I could obtain, and I believe I have practically all that is available. I have given the matter most careful consideration from every point of view and I conscientiously believe that I am acting for the best interests of the Territory in making the recommendations that follow.

DESCRIPTION.

Piilhonua is a government land, under a crown lease to the Hon. John T. Baker of Hilo. The lease (No. 531) expires on March 21, 1921. The upper part of the tract is sublet to Mr. W. H. Shipman and constitutes the Puu Oo Ranch. The lower line of Mr. Shipman's lease extends almost due north across the tract from the point on the 1855 lava flow, known as Reed's Island, at an elevation of approximately 5,000 feet. The lower portion of the tract is covered by the fields of the Hawaii Mill Company's sugar plantation. The cane lands reach up to an elevation of about 2,000 feet.

The section between the cane fields and a forest fence constructed by Mr. Shipman at some distance above the line of his lease, constitutes a part of the Hilo Forest Reserve, established in July, 1905.

Between the limits named the land is heavily wooded. On the lower and middle sections the forest consists of a mixed stand of Ohia Lehua and Koa trees, mainly of large size. At an elevation of approximately 4,500 feet is a belt of pure Ohia forest. Above this and extending to and above the Shipman fence the forest is again composed of Koa and Ohia, in mixture. Throughout the forest is a heavy undergrowth consisting of tree-ferns, low shrubs and small trees, and high growing ferns and brakes. In places are tangles of ie-ie vine and uluhi. The soil where exposed is a reddish clay, a foot to eighteen inches or more in depth.

The belt of pure Ohia is evidently the point of greatest precipitation from the trade wind clouds; though throughout the forest, from the plantation clearing to the Shipman line, the rainfall is heavy. All over the area are springs, pools and swamps that feed the numerous small tributaries to the Wailuku River and its several branches. Practically the whole drainage basin of this stream is on Piihinua, for the water that comes from higher up than the section watered by the trade wind clouds is limited to the flow resulting from Kona and other local storms.

Very little is known accurately of the actual sources of the water in the streams, or from which part of the forest they are most largely fed. But the indications are that from one-third to one-half of the water comes from the area of pure Ohia forest, above described, while the remainder is the result of springs and swamps lower down. These springs are dependent for their sustained and equalized flow on the protection afforded by the forest cover.

At present the water from the Wailuku river is used for fluming cane and for turning the power wheels of the Hilo Electric Light Company. For these purposes it is diverted at points near or below the 2,000 foot level.

RECOMMENDATIONS.

Having given the problem thorough and careful study, both on the ground and in its various relations, I cannot report favorably on the proposition to lumber this tract. My principal reasons for this decision are three in number.

First: I believe the greatest value of the forest on Piihonua to be in the influence which it has on the drainage of the Wailuku River and its branches, i. e. on the affect the forest exerts on the water after it reaches the surface, by equalizing the flow and preventing excessive run off. In view of its present use and possible further development for water power, irrigation and even for domestic supply—especially in connection with the growth of

Hilo town—I regard the Wailuku as one of, if not the, most important stream protected by a forest reserve in the Territory.

It might be possible, if the work were done under careful restrictions, to remove some of the mature trees from the Piihonua forest without detriment to its water conserving qualities. But to make lumbering profitable the operations would have to be conducted on a large scale. This would inevitably involve the opening up of considerable areas in sections where a complete forest cover is most needed. Such a policy on this particular water shed would be fraught with danger. It is a risk which I do not believe the Territory should take. For the money to be obtained as stumpage would in no way compensate for the injury that would result were the regular flow of the Wailuku River seriously interfered with.

For this reason I am opposed to lumbering the forest on Piihonua.

Second: The forest policy of the Territory has been and is to create a chain of forest reserves that are essentially "protection forests." On the leeward side of the island, where because of the absence of running streams watershed protection does not figure, I am in favor of utilizing the merchantable timber. But on the windward side of Hawaii I believe that the forest in the several established forest reserves should for the most part be kept intact, at any rate for the present.

If this is so in general it is particularly true of the Hilo Forest Reserve; for with the growing importance of Hilo town and the Hilo District, through the construction of the breakwater and the building of the Hilo-Kohala Railroad, the streams coming from the reserve will be needed more than at any time in the past.

Considering the large area of privately owned land in the Hawaiian forest reserves it is essential that a uniform and consistent policy of forest protection be maintained, in order that the owners of this land may be brought to coöperate with the Government in its management. The granting of logging rights on such a land as Piihonua would, I fear, tend to weaken the public sentiment that supports the reserve work, if indeed it did not react unfavorably on the whole forest policy of the Territory.

Therefore, on this count also, I believe the logging of Piihonua to be inexpedient.

Third: My third reason is from a professional standpoint. Forestry rests on a business as well as on a scientific basis. In the consideration of such a problem as the lumbering of the Piihonua forest, the factor of whether or not it would pay is an essential one.

Even were it desirable that lumbering should be permitted, it would in my judgment be necessary, in order to safeguard the favorable conditions of stream flow that now exist, to load the con-

tract with stringent regulations as to the area to be logged, the methods to be used and the subsequent treatment of the tract. From the situation of Piihonua in relation to transportation, the cost of logging would at best be high. When to this were added the necessary restrictions and stumpage at the price which I believe the Territory should demand, I cannot see how there would remain any margin of profit for the contractor undertaking the work.

Looking at the matter in this light I should not be justified from the standpoint of professional ethics, in tacitly recommending the project by approving conditions under which logging might be carried on.

On this third count, then, I cannot recommend lumbering on Piihonua.

I recommend, if the Board approves this report, that copies be sent to the Governor and to the Commissioner of Public Lands.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

IMPORTANT PUBLICATION.

The New Agriculture, by T. Bayard Collins, 12 mo., 374 pages, 106 illustrations, cloth, price \$2.00. Messrs. Munn & Company, New York.

We have great satisfaction in bringing before our readers the above publication which has recently been issued from the Scientific American press. This work deals with the realm of agriculture in an authoritative manner and from a new and attractive view point. The author has devoted a life time to the study of changing economic agricultural condition and urges the call of the farm as an alluring and profitable undertaking. Farm life was never so attractive as today, and its call is alluring thousands from office work. The drudgery of the old farm has passed away and the use of improved methods, perfected machinery, and newly evolved stock, has created a greatly increased means of attaining wealth by enhancing the value of the product and by decreasing the cost of production.

The slogan "Back to the Soil" strikes the keynote of the opening chapter of the book. We stand on the threshold of an era wonderful in the annals of agriculture: an era in which experiment, invention and experience will transmute the labor of the field into wealth and health and happiness and length of days. The invitation is to all men and is being eagerly embraced by all classes. Lands before considered worthless, now bloom and blossom as the

rose. Roads formerly impossible or impracticable are now transformed into highways of profit and delight. Frosts are defied by newly created varieties of fruit and grain. The seedless apple and the pitless plum have been attained. The size of fruits and flowers and roots have been doubled and the mystery of transmuting the colors of nature has been solved. And so far only the first step has been made into the realm of the agriculture which the new century has ushered in.

The vast systems of irrigation which are transforming the great West are treated at length. By means of these achievements the uncertainty of the agriculture of yesterday resolves itself into the certainty of today. Irrigation projects bring about a more even and general prosperity, more compact communities and better social opportunities.

The principles and importance of fertilization and the possibility of inoculating the soil by means of nitrogen-gathering bacteria are given due importance and a chapter is devoted to the importance of canals and good roads and to their relation to economy and to social well being.

One of the most interesting features of the book is its description of new industries. Among those described at length are the rice fields of Louisiana and Texas, the keeping of the angora goat for its fleece, the cultivation of the Smyrna fig and the date, the production of tea and the manufacture of perfumery and drugs.

A most fascinating account of the manner in which experimenters are endeavoring to subject to human control, the size and shape, the color, taste and odor, the fecundity and inherent qualities of the whole of plant life, is presented. The "white blackberry," the "citrange," the seedless apple, the "tangelo" and many other marvellous blends are described.

The latter part of the book describes the practice of the new agriculture and the new machinery which has recently been brought into operation.

The New Agriculture is excellently illustrated with over one hundred half-tone illustrations—the majority of them full page. We heartily recommend this work for general reading and also as a handbook of practical usefulness. Its careful perusal should act as an inspiration to many a toiler at the desk and should assist many a youth to a decision of life's vocation.

U. S. IRRIGATION AND DRAINAGE INVESTIGATIONS.

Bulletin 191, Tests of Internal-Combustion Engines on Alcohol Fuel.

The tests reported were made on engines using both gasoline and alcohol. Detailed results in fuel consumption and in power produced are given.

Application for this bulletin should be made to the Office of Experiment Stations, Washington, D. C.

WOLVES IN RELATION TO STOCK, GAME, AND THE NATIONAL FOREST RESERVES.

By VERNON BAILEY, U. S. Department of Agriculture, Forest Service,
Bulletin 72.

The above publication, although touching a condition of agriculture from which these islands are most fortunately exempt, is of great interest to the general reader and we therefore refer briefly to some of its chief data:

The enormous losses suffered by stockmen on the western cattle ranges and the destruction of game on forest reserves, game preserves, and in national parks through the depredations of wolves have led to special investigations by the Biological Survey in coöperation with the Forest Service, to ascertain the best methods for destroying these pests. The results appear in the present report, which includes also field notes on the distribution, abundance, and breeding habits of wolves.

The chief object of the report is to put in the hands of every hunter, trapper, forest ranger, and ranchman directions for trapping, poisoning, and hunting wolves and finding the dens of young. If these directions are followed it is believed that the wolves can be so reduced in number that their depredations will cease to be a serious menace to stock raising. Prime wolf skins are worth from \$4 to \$6 each, enough to induce trappers and enterprising ranch boys to make an effort to secure them if a reasonable degree of success is assured. Stock owners need little encouragement to catch or kill wolves on their own ranges, and it is believed that the forest rangers will be able to keep them down on the forest reserves. Their complete extermination on the western range is not, however, to be expected in the near future, and it is only by constant and concerted effort that their numbers can be kept down sufficiently to prevent serious depredations.

The wolves of North America are divided into two groups—the smaller coyotes, or prairie wolves, of the western United States, Mexico, and southwestern Canada, comprising several species and subspecies; and the larger gray, black, or timber wolves, distributed practically throughout the whole of North America from Florida and the table-land of Mexico to the Arctic Ocean.

The stock killed by wolves is mainly cattle. Calves and yearlings are generally selected, but if these are not available, cows, and even full-grown steers, are killed. They are usually attacked from behind and literally eaten alive. Occasionally an animal will escape the wolf with a great piece torn out of its ham, while the wolf goes on to catch and kill another. The ranchmen in the wolf country maintain that a "critter" even slightly bitten by a wolf will die of blood poisoning, and many detailed instances seem fully to substantiate this. More cattle are therefore killed than are eaten. Evidently the wolves prefer freshly killed beef. In summer they rarely return for even a second meal from the same animal; but in winter, when in the snowy north the cattle are gathered into pastures or stables, they often return to a carcass until its bones are picked. The actual number of cattle killed by wolves can not be determined.

A considerable number of colts and a few grown horses are killed by wolves, but the number is insignificant compared with that of cattle. Evidently this is not a matter of choice of food, for trappers generally agree that wolves prefer horseflesh to beef.

Herdéd sheep are rarely troubled by wolves, which are kept at a distance by the presence of herders and dogs. Occasionally, however, an unguarded herd is raided and a large number of sheep are killed, but so rarely that in open country sheep men have little fear of wolves in comparison with coyotes and wild-cats. Goats and hogs are, however, frequent victims of wolves, which in some States kill great numbers of these

animals. The amount of game killed is less easily determined than of cattle, but, judging from the evidence obtained, wolves kill far less game in the western United States than either coyotes or mountain lions.

As protective measures against the depredations of wolves fences are recommended. Bounties, even when high, have proved ineffective in keeping down the pest and the more intelligent ranchmen question whether the system pays.

The methods usually employed for the destruction of wolves are hunting with rifle or with dogs and horses, capturing the young in the dens, trapping, and poisoning, a description of each of which expedients is given. Most of the wolves trapped are less than a year old, generally spring pups caught the following fall or winter. After a wolf has reached his third year and run the gauntlet of traps, poisons, guns, and dogs, its chances of dying of old age are excellent. Around the dens the old wolves are especially wary, and so suspicious of both traps and poison that attempts to catch or poison them are futile. Scents and baits make them only the more suspicious.

THE NEW ANTI-OPIUM REMEDY.

Mr. L. Wray, Director of Museums of the Federated Malay States, has published in the *Journal of the Federated Malay States Museums* an account of the new anti-opium remedy and of the results obtained from its use in Selangor. As the subject has aroused considerable interest both in this country and on the Continent, a brief abstract of his article may prove of interest.

The discovery of the property of the plant is told by two of the men in charge of the factory of the Selangor Anti-Opium Society in Kuala Lumpur. A party of Chinese wood-cutters, working in the jungle near Seremban, ran out of tea, and to supply its place took the leaves of a jungle climber, dried them, and used them as tea in the ordinary way. But the beverage made the men ill with bowel complaint. The leaves were then roasted, and a fair substitute for tea was obtained, which had no ill effects. Then, for some obscure reason, some opium dross, consisting of the refuse opium after being smoked, was mixed with it, and the men continued drinking the mixture for a week or more in place of tea. After this time it was found that all desire for opium-smoking had been lost. Friends of the men made known the discovery, and so the news was spread, and other men were induced to try the remedy. Mr. Wray suggests that the plant may act as an astringent, preventing the distressing intestinal troubles which usually supervene on a stoppage of the customary supply of opium, and render it difficult to leave off its use. The mode of preparing the remedy is as follows: About 8 oz. to 10½ oz. of the roasted leaves are boiled for about three hours in about four gallons of water. The liquid is then strained through a white cloth and poured into barrels, and supplied direct from the barrels to the bottles brought by the patients; but, as the infusion contains no preservative, it is readily subject to fermentation, and often has to be thrown away and a fresh supply obtained.

The decoction is prescribed thus: Whatever the amount of opium a man habitually smokes, that amount is to be mixed with the infusion. It may be mentioned here that the average opium smoker takes from two to three chi (116 2-3gr. to 175gr.) of chandu per diem. This quantity is often exceeded, and in one case 1½ tahil (875gr.) is stated to be the daily allowance of a particular smoker. Chandu, which is the opium as prepared by the Chinese for the use of smokers, is less potent than the official extract of opium of the British Pharmacopœia. In the act of smoking a considerable quantity of the alkaloids contained in the chandu is certainly destroyed, and only a mere fraction is absorbed into the system of the smoker. To proceed, if, for instance, a man has been in the habit of smoking two chi

of chandu per day, then two reputed quart bottles (a) and (b) of the infusion are taken, and into one (a) is put two chi of burnt chandu, roasted on an iron skewer-like instrument in the same way as it would be if being prepared for smoking. Then a Chinese teacup is half-filled from bottle (a) and taken by the patient, and half a teacup from bottle (b), the one that does not contain any opium, is put into (a). This is repeated each time a dose is taken, so that the liquid in (a), while containing its bulk, continually decreases in its opium contents until the bottle (b) is exhausted. The dose is to be taken as many times a day as the patient has been in the habit of smoking, usually three or four times, until the two bottles are finished, when the man should, it is stated, be cured of all wish to smoke. If this is not the case, then the treatment is to be repeated, but with a smaller initial proportion of burnt opium in bottle (a), the amount being again decreased if a third course is necessary. It is stated that sometimes two courses are sufficient, but generally three are required.

At the Weld-road establishment of the Selangor Anti-Opium Society in Kuala Lumpur, from November 16 to 23 last, about 396 patients had reported that they were completely cured of the habit. Before that date no records were kept. Many patients naturally do not trouble to return and make a report. The Rev. W. E. Horley wrote on December 6 that about 8,000 people had applied at the Methodist Episcopal Mission hall in Sultan street, Kuala Lumpur, and over 7,000 in Ipoh, Perak, within the last few weeks. It is instructive to note that the monthly official opium returns showed during November a decrease of 38 chests of opium and in December 32 chests, the lesser number in December being probably due to the return of a certain number of patients to their opium pipes. The success obtained has led to the opening of branches of the Selangor Anti-Opium Society at Kepong, Rawang, Serendah, Sungai, Besi and Kajang.—*Mail*, May 24, 1907.

BY AUTHORITY.

Notice is hereby given that R. von L. Domkowicz, Esq., has been appointed District Forester for that portion of the District of South Kona, extending from the District of Kau to the land of Kaohe; and District Fire Warden for that portion of the District of South Kona, extending from the Kau District line to and including the land of Kaapuna, Island of Hawaii.

Notice is hereby given that A. W. Carter, Esq., has been appointed District Forester for the District of South Kohala, Island of Hawaii.

Notice is hereby given that Samuel M. Spencer, Esq., has been appointed District Fire Warden for the District of South Kohala, Island of Hawaii.

Notice is hereby given that C. J. Austin, Esq., has been appointed District Forester for the District of Hana and that portion of the District of Koolau, lying between the District of Hana and the Makapipi Gulch, Island of Maui.

Notice is hereby given that W. F. Pogue, Esq., has been appointed District Forester for the Eastern half of the District of Hamakualoa and that portion of the District of Koolau, lying between the Hamakualoa District and the Makapipi Gulch, Island of Maui.

C. S. HOLLOWAY,
President and Executive Officer Board of Agriculture and Forestry.
Honolulu, T. H., August 5, 1907.

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SEPTEMBER, 1907

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform Hawaiian readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER & AGRICULTURIST

VOL. IV

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No. 9

We publish in this issue a contribution from Mr. Jacob Kotinsky upon the opportunities and future sphere of work of the College of Agriculture and Mechanic Arts, which is now in process of formation in the Territory. The Forester has already contained the expressions of opinion of many prominent citizens upon the utility and work of the new institution, but the general interest which is taken in its operation warrants the publication of still further information on this important subject.

The writer of the present article speaks chiefly from the agricultural standpoint, being justified in doing so by his graduation in agriculture from a State College, and also by a three years' residence in the Territory. During this time he has been intimately associated with the agricultural problems of the islands and with the methods of bringing about their solution. We feel, however, that his paper relates as cogently to the mechanic art phase of the question, and it is only the writer's desire not to appear too didactic, that has induced him to confine his observations to that part of the subject which has fallen more directly under his observation. His close study of the economic development of other countries allows him moreover to approach the subject from a different viewpoint than that of writers of former papers which have been published, who generally have been restricted to treat only a certain phase of the question.

It is axiomatic that the true sphere of work of the new College of Agriculture lies wherein it will affect from an agricultural and mechanical point the greatest good, to the greatest number of the residents of the Territory. This certainly would seem to point to concentrating its chief energies to increasing the agricultural and mechanical efficiency of that part of the community whose inclinations will lead it to remain

in the Territory, and by this means, permanently increase the economic prosperity of the islands. It will also probably be admitted that the development of the curriculum of the college should proceed by natural growth from the elementary to the advanced.

The citizens who appear to offer the most ready material for the new institution to operate upon are primarily the Hawaiians and the Portuguese. There is also, of course, a very considerable number of other nationalities awaiting to participate in the benefits of the college, but the two peoples already mentioned would probably form the bulk of those whose lot could be most readily reached and ameliorated. Upon such people, imbued with a love of the islands, practical courses of instruction would most readily affect the local standard of efficiency, for they would remain in the Territory and become a permanent factor in the development of the community.

The desire to make Hawaii a center of tropical agricultural learning and practice is a laudable one, as is also the wish to create in our midst an institution of advanced academic instruction. These objects can, however, only be achieved by many years of patient upbuilding. It should also be remembered by those who wish the new institution to attract students from the Mainland to study tropical agriculture, that such visitors would in all probability seek an outlet for the expression of their knowledge in other countries, and that they would do little for the welfare of Hawaii. It is also to be considered that our islands are, strictly speaking, not tropical and any great success attending a local institution of tropical agriculture would induce the establishment of like colleges in countries more favorably situated for tropical experiment, to which those desiring actual tropical experience would no doubt repair. It therefore would certainly seem our best policy to make the attraction of mainland students a minor consideration and to concentrate the chief energies of the new college to the advancement of those of our population who are most likely to add to the economic prosperity of the Territory.

*OUR AGRICULTURAL COLLEGE IN THE LIGHT OF
OUR NEEDS.*

By JACOB KOTINSKY.

Before proceeding I must explain that in the discussion to follow I have particular reference to the course in agriculture. While I have an opinion as to the aims of the Mechanic Arts courses, it is not that of the confidently competent judge, being out of my line of activity,—nor is this the place. But as a graduate in agriculture from one of our State colleges (New Jersey) and as a 3 years' resident of this Territory who has made a conscientious study of the needs of these islands in this respect, I feel in a position and obligated to voice my sentiment in the matter. In this sentiment I know I am supported by at least one member of the present Board of Regents, and probably also by many other fellow-citizens.

OUR PRESENT PRESSING NEED.

It is no longer disputed that the agricultural element of a community is its most valuable asset. It is *the* element that makes for civic virtue and prosperity. The greater the number of intelligent, enlightened individuals constituting a community, the richer, the more intelligent is that community. And the average farmer in the United States of today is an intelligent man. He is a man versed in many of the sciences pertaining to his vocation, and is an intelligent citizen besides. Farming today is no longer mere manual labor. The farmer now is a practitioner of the natural sciences and a business man. The educational work of the U. S. Department of Agricultural and the State experiment stations and agricultural colleges during the past generation was not in vain. Close inquiry will reveal that the mainspring of wealth of the United States during the past decade have been and still are the bumper crops produced by the farmers year after year with increasing celerity.

Our climate, our vast areas of unsettled, productive lands, the nature and quantity of crops this land is capable of yielding under proper management, and the vast market at our very door cry to high heaven for settlers, for cultivators, for farmers. But thus far the cry was vain. Our large and profitable sugar industry is merely an indication of what could be accomplished here in agri-

culture if intelligently pursued. We have waited and waited in vain for settlers to come to us from other shores. The few that came prospered, but their number is limited. And the attraction to others must be equally limited at least as compared with others elsewhere or they would have sought our shores more freely.

From among ourselves we had not the opportunity hitherto to produce farmers. Farmers I mean in the modern sense of a farmer. The farmer that pursues methods of a generation ago is a failure even in America, the land of highly intensive cultivation and enormous yields. None but similar results could be expected from old-fogy-method farmers here. The Californians that came succeeded because they had the experience of years to back them. They could not but succeed. Their experience too was gathered in a state where modern methods of cultivation, irrigation, cropping, and marketing prevail. Failure for them was practically impossible.

But if we can not lure more of this kind from the mainland we need not despair. We have in our midst a population that for generations did business with mother earth. A people of the land and for the land even here. A people that has served its apprenticeship in our fields. A people that has learned to love and cherish this land, to regard it as home, and will be satisfied with no other land for home. Watch them flock back from California whither they were lured for a while by the gold brick of high wages. Why do they so eagerly return to the islands? Because this is their home. Their relatives, associates, friends—all are here. They love Hawaii, its hills, its valleys, its air, its water, its soil.

I refer here particularly to the Portuguese. But is there any reason why this does not apply to all Hawaiian-born persons, be they natives, whites, Portuguese, or a mixture of them all? Even transients are charmed by the country. Those that tarry here a year or two are irresistibly drawn to our shores when they leave them. Our attention, therefore, should be directed towards developing our internal resources. We should strive to anchor our own people, our own candidates to the soil. We have the soil, we have the people and all other requirements, and need but weld them together to create the coveted farming element.

Until now our provisions for making farmers, for attaching the floating population to the land were inadequate. To offer land is not sufficient. Man upon land without tools is a sorry sight. But

the main implement of the farmer of the day, is a knowledge of at least the rudiments of the science of agriculture, and this implement we had no means of providing. Moreover, few men will at a mature age undertake to acquire the necessary book knowledge to guide them in their pursuit, and book information is but the gear by the aid of which one is enabled to steer clear of error. Any quantity of bulletins will not create a farming population where there is none. These are intended to help those that are already tillers of the soil. We must catch the youth that is agriculturally inclined and mold it into condition to manipulate the land successfully. Youth so inclined, and so trained is inexorably bound to the soil, and other conditions not being adverse, is bound to make a success of farming. Gradually we may hope thus to build up a farming population from within rather than wait for possible settlers from without. Around this class as a nucleus a desirable community is built up. Their success will be the magnet to attract others from without.

Moreover, young men equipped with the necessary knowledge for agricultural work, will find the means of opening up land tracts now closed, and overcoming obstacles in transportation and marketing. Given a farming population and we can depend upon it that the incidental problems will be solved.

As a parallel to the reasons advanced for aiming at converting our own growing generation into agriculturists one may cite our Normal School, as a case in point. Were we dependent upon mainland teachers our supply would never answer our needs. By preparing our own teaching staff we are provided with a body of teachers that can be depended upon to stay with us. So also to populate our soil we will act wisely to draw upon our own sons and daughters. Once settled they will be certain to stay with us and help us build the state to which we so fondly look forward.

WHAT THE COLLEGE CAN DO.

To meet this urgent need our last Legislature has wisely made provision for a college of agriculture. But much of the work of building up a farming community from within will depend, I believe, upon the nature of agricultural course the college will provide. It is doubtless flattering to any community to be in a position to provide higher education, be it technical or other. We could model our college after California or similar state colleges. The graduates of this college would doubtless make excellent

professors or specialists for our own and other colleges or experiment stations. In other words by giving our Agricultural graduates a technical education in tropical agriculture we will glory in supplying the tropical world with experts and teachers. We will teach the tropical world how to take best advantage of its agricultural fields. But what of ourselves? What material advantage will accrue to these islands from such a course? Glory galore and little else!

No one than the writer favors higher education more. But he is aware at the same time that higher education is a luxury we can not afford. If a young person is apt, so inclined, and has the means, he could be provided with a post graduate course in any specialty that he may desire and then proceed into the teaching or investigating fields. Similar facilities may be provided students outside of the Territory should they seek our institution for special knowledge in tropical agriculture. But our aim for our own salvation and the redemption of our uninhabited soil should be to convert our main body of agricultural students into men and women willing, eager to and capable of settling on the land and till it for a livelihood. If we fail to attain this end, our college, so far as the good of this land is concerned, is a failure. Our community is essentially agricultural so that the other courses are a negligible quantity, notwithstanding the possibility that the agricultural course may be the least attended. The latter fact also will depend upon the relative sentiment for agriculture that will be inaugurated in the college.

The work of our agricultural college ought, in the opinion of the writer, to be along four lines. First, the main body of the course should be outlined with the single view in mind of making intelligent farmers out of those pursuing it. Practical or field work should be amply provided for, the class room work serving as the handmaiden of the other.

Secondly, provision should be made for short, special courses in various branches of agriculture for the accommodation of those who can not afford either the money or time for a full course.

Thirdly, a course in agriculture and natural sciences should be arranged for our teachers, both present and prospective, the pursuance of which should constitute part of the Normal School curriculum and obligatory to the students thereof.

Fourthly, provision should be made for post graduate work for those seeking higher degrees in tropical agriculture.

THE FEDERAL LAWS RELATING TO STATE COLLEGES OF AGRICULTURE.

In order to establish our college on a firm basis we are obliged to accept the Federal grant toward the maintenance of such an institution and must, therefore, comply with its requirements. The Congressional act of 1862 establishing the so-called "Land grant Colleges," in section 4, reads, ". . . the moneys . . . shall be inviolably appropriated . . . to the endowment, support, and maintenance of at least one college where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts in such manner as the legislature of the States may respectively prescribe, in order to promote the liberal and *practical* (the italics are mine) education of the industrial classes in the several pursuits and professions in life."

Section 1 of the 1890 Act for the further endowment of Agricultural Colleges, the so-called "Second Morrill Act" reads in part, ". . . twenty-five thousand dollars, to be applied only to instruction in agriculture, the mechanic arts, the English language, and the various branches of mathematical, physical, natural and economic science, with special reference to their *applications in the industries of life* (italics mine) and to the facilities of such instruction."

Finally the "Nelson Amendment" to the "Adams Act" of 1906 reads in part, ". . . the annual sum to be paid thereafter to each State and Territory shall be fifty thousand dollars, to be applied only for the purposes of the agricultural colleges as defined and limited" in the previous two acts.

So far as can be seen therefore the various acts of Congress do not limit the appropriations to higher institutions of learning, nor are colleges defined as such specially. As to precedents of practical schools of agriculture supported by these Federal funds one needs but look at Kansas, so ably represented by Miss Reed at the last Farmers' Institute meeting, Illinois, Connecticut, and many others.

BEES AND LANTANA.

The Lantana is included in a list of West India bee plants, although in these islands bees do not appear to make use of this source of honey supply.

FOOD INSPECTION DECISIONS.

The following Food Inspection Decisions are contained in a recent publication of the Bureau of Chemistry, U. S. Department of Agriculture. They are of sufficient interest to be reprinted in full:

THE USE OF SUGAR IN CANNED FOODS.

Numerous inquiries have been addressed to the Department respecting the proper labeling of canned fruits and vegetables to which sugar has been added. Sugar is a wholesome food product, and is also condimental. It reveals its own presence by its taste. Its addition to a food product can not be objected to on the ground of injury to health.

It is held by this Department that sugar can be used in the preparation of all food products where it is not used for fraudulent purposes. If sugar be added without notice to Indian corn which is not sweet, for the purpose of making it appear a sweet corn, to be sold as such, it is used for a fraudulent purpose, and for this reason is prohibited by the law.

In section 7 of the law it is provided that a food is adulterated "if it be mixed, colored, powdered, coated, or stained in a manner whereby damage or inferiority is concealed." It is evident, therefore, that a food product can not be mixed with any other substance for the purpose of concealing damage or inferiority. A vegetable which is not naturally sweet could not be sold as one which is naturally sweet by mixing with sugar without violation of the law, unless the addition of sugar is plainly indicated on the label.

The addition of sugar to canned vegetables is not for preservative purposes. Added sugar increases the tendency to fermentation. It is added wholly as a condimental ingredient.

It is held, therefore, that the addition of sugar to a substance not naturally sweet, converting it into a substance which might seem naturally sweet, is justified if the label plainly indicates that this sweetening material is added. In other cases, where no deception is practiced, the mention of the presence of sugar is not required.

The term "sugar," as used herein, is confined to sucrose (saccharose), either in a solid form or in solution.

POLISHING AND COATING RICE.

It has been represented to the Department that it is a very common practice in this country in the preparation of rice for commerce to treat it in the following manner:

1. The rough rice is passed through a set of stones, or shellers, which removes the hull.
2. The product is subjected to a series of scouring machines by which the bran and cuticle are removed.
3. The rice is passed through a machine that is known as the brush, which removes a portion of the flour, or more commonly known as polish.
4. The rice is introduced into a warm revolving drum or cylinder holding often as much as 4,000 pounds, and glucose and talc are added in the following manner and in about the following proportion: As the rice is fed into the drums a small proportion of glucose and talc is applied, namely, glucose one one thousandth and talc one three-thousandth part of the whole. The object of the glucose is to form a coating by means of which a part of the talc is held on the surface of the rice.

It is stated that the rice is coated for the following reasons:

1. The coating makes the rice less susceptible to dust and other foreign matter during transportation and storage.
2. It is, in a measure, a preventive against the attack of the weevils and worms which are so destructive in warm climates.

It has also been represented that in some instances paraffin is used instead of glucose and that rice starch is sometimes used in place of talc for the purpose of finishing rice according to the method described above.

In submitting these representations it has been asked if the process above described is permitted under the food and drugs act of June 30, 1906. It is not clear to the Department that coating rice in this way protects it in any manner from dust. Evidence of an expert character is also on file in the Department showing that unpolished rice is no more subject to the ravages of the weevil than the polished article.

It is the opinion of the Department that no coating of any kind can be used in the manner indicated if the product "be mixed, colored, powdered, coated, or stained in a manner whereby damage or inferiority is concealed." In each case whether or not such a result be secured is a question of fact to be decided by the evidence.

It is held by the Department that rice treated in the manner indicated above with glucose and starch should be labeled in all cases with the name of the extraneous substances, as

"COATED WITH GLUCOSE AND STARCH."

In such declarations all of the food substances used for coating should be mentioned. Any coloring matter or other substances that may be employed to change the tint of the rice should be declared on the label.

The question of the wholesomeness of paraffin, talc, or other non-food substances used is to be construed in such a way as to protect the health of those most susceptible to their influences. Rice is a diet often prescribed for those suffering from impaired digestion. The use of paraffin in such cases is at least of questionable propriety, and in the opinion of the Department it should be excluded from food products. Under the fifth provision of foods, section 7 of the food and drugs act, June 30, 1906, and under Regulation 14 the use of talc is permitted, provided that each package be plainly labeled with the name of this preservative and the proper directions for removal be given.

THE PRICE OF AWA ROOT.

In answer to a correspondent, we have ascertained that the present market value of awa root in London is about eleven or twelve cents per pound. The demand for the article is, however, limited. This information affords an interesting comment upon the little profit to be expected from the collection of awa, numerous references to which have lately been made in the local press.

REVIEW OF ENTOMOLOGICAL LITERATURE.

By JACOB KOTINSKY.

"The Sugar Cane Leaf-Roller (*Omiodes accepta*) with an Account of Allied Species and Natural Enemies." By Otto H. Swezey. Bull. V, Division Entomology, H. S. P. A. Experiment Station. 8°, 61 pp., VI plts., 3 text figs.

To the habitual reader of entomological literature a paper by Mr. Swezey is always a treat. It is always replete with useful and interesting information, systematically arranged and readable alike to the veteran and novice. The present bulletin, because it treats of insects affecting sugar cane, was written primarily for the growers of that plant. But it contains also so much information on insects affecting other plants, especially our notorious cocoanut leaf-roller, that it is well worth the perusal of many of us. Besides, the sugar cane leaf-roller feeds on grasses also.

In this bulletin the author describes, figures and gives the life histories of all (15) Hawaiian species of the genus *Omiodes*. "They are all native to the Hawaiian Islands and occur nowhere else," he tells us. One of these (*O. meyricki*) he describes as new to science. The tables for the determination of adults and caterpillars and their parasites will prove extremely useful to the future student of these insects.

A brief chapter is devoted to remedies, and it is interesting to note that this is followed by one of 20 pages and 2 plates on natural enemies wherein descriptions, habits and figures of 15 species of parasites and predators are given. In the introductory paragraph the author says: (p. 37) "Since so many (of the pests) are killed by parasites, and yet there are enough left to do considerable injury at times, one can not help but wonder to what extent these pests might increase were there no parasites preying on them, and how many times more serious would be the damage done by them. The extreme difficulty and impracticability of treating sugar cane fields, or large palm trees, artificially, for the destruction of these pests, makes it all the more important that there are so many valuable parasites preying upon them; and shows the value of introducing natural enemies to control a pest, for the four best parasites of these leaf-rollers are introduced species . . . ", of these 4 species 3 are definitely known to have been

introduced by Mr. Koebele. Thus after 14 years of incessant labor in introducing useful insects to these islands Mr. Koebele's efforts are gaining scientific recognition, and the government of these islands deserves credit for the wisdom of securing his services and retaining them all these years.

To those of us who are accustomed to receive all the State bulletins gratis, and who are familiar with the prices charged for bulletins by the Superintendent of Documents at Washington the price set for Mr. Swezey's bulletin is rather high. Unless special inducements are offered to islanders it is hard to see *how* many copies will get into their hands. That it would be desirable for all concerned is beyond question.

GROWING BULBS IN WATER.

One of the most artistic and inexpensive methods of cultivating blooming plants for home use is to grow bulbs in water. The Chinese are expert in this work and at their New Year festival the streets of Honolulu show a profusion of their sacred lily in full bloom. Very many varieties of flowering bulbs may be successfully grown in water and it is surprising that this easy method of producing handsome blossoms should have been allowed to remain so long neglected.

In selecting bulbs for this purpose, large heavy ones should be chosen. In many cities glasses are made especially for the purpose of growing the handsome flowers of the hyacinth, but any open bowl or vase can be used for these and other bulbs.

If grown in an open bowl, the bulbs selected for blooming should be supported with a sufficient quantity of clean small stones or pebbles to allow the developed plants to retain their upright position. Water should then be poured over the stones until it reaches the base of the bulbs. The bowl should now be kept in a cool dark place until the roots have attained a good growth, care being taken to replace the water as it diminishes. When the bulbs are required to bloom, the bowl should be removed into a light warm atmosphere, when spikes of blossoms will soon be thrown up.

Besides the Chinese sacred lily or narcissus, many other bulbs can be made to produce blossom in this manner. Among these hyacinths, jonquils and crocuses have all produced satisfactory results.

IMPROVING HAWAIIAN PASTURES.

By G. C. MUNRO.

(Continued from the August Forester.)

Chloris gayana: Rhodes Grass. Though of much later introduction this grass I believe will prove as valuable as, or perhaps even more valuable than *Paspalum dilatatum*, though in a different way. Mr. A. W. Carter, when agent for the Molokai Ranch, found notice of it in an Australian publication, to which country it had been sent from South Africa by the late Cecil Rhodes. Mr. Carter secured a small package of about two ounces of seed in 1904 and it was sown in November of that year. From that packet were saved two gunny sacks of seed, and a nice little rick of hay was cut in May. In 1906, from the old roots, 10 bags of seed were saved. Now, in March of 1907, there are about 30 acres of it to be cut for hay, and the young grass is growing thickly wherever it seeded last year. It is as a hay grass that this grass will be especially valuable, as it grows with great rapidity and forms a dense stand up to 5 feet high when in seed. It has the advantage of being green and in flower after the dry season has set in and when the weather is favorable for curing hay on the dry ranches. This was my experience of it in 1905 and 1906 on cultivated land, but whether on old land it would keep as green remains to be proved. It is a great drought resister and though I have seen some large plants in their second year killed by drought, yet on cultivated land it grew and flowered right through the excessively dry season of 1906. This may, of course, be due to some extent to a system of dry farming, by a number of chickens scratching for seed and keeping the surface loose, thus conserving the moisture below.

The seed was first allowed to ripen and the seed heads reaped. The paddock was then mowed for hay, and though not an ideal way of hay-making yet the hay was relished and soon eaten by the stock in the dry season. It has yet to be shown whether it will furnish hay in quantity from old fields, at what time it should be shut off for this purpose, and also what amount of grazing it will stand in the pastures. I feel sure that with this grass some of the dry ranches here could not only put up a reserve supply of hay for the dry seasons and periods of drought for their stock,

but also could supply all the hay needed for the plantations and thus stop a source of weed supply to these Islands.

Rhodes grass seeds very heavily and to some extent continuously throughout the year. The main crop ripens about May and June, but it still continues to flower. The seed germinates very readily and the young plants stand a great amount of dry weather whilst young. It will not stand much stocking in its first stages. Horses and sheep are especially hard on it, as they pull off the long runners which are a characteristic of this grass, before they get properly rooted and bite off the whole top of the plant. Some roots planted in a mass of honohono and not under stock grew into strong bunches laden with seed and promised to entirely get the better of the other plant.

I feel sure that with *Paspalum dilatatum* on the uplands, and Rhodes grass hay grown on the drier country and fed to stock with kiawe beans, the markets here will eventually be supplied with prime beef and mutton at all seasons of the year, instead of the present condition of all the ranches having their stock fat at the same time.

It will be found best, I think, in cultivating this grass for hay to plow and cultivate the fields and sow the seed, as then the fields will be levelled and ilima and other shrubs got out. It seeds so enormously that a very small amount of seed only is necessary for a start and this can easily be obtained here from ranchers growing it, or from Australia. The introduction of *Chloris gayana* and of *Paspalum dilatatum* alone, were worth all the expense, effort and disappointments in the experiments connected with the introduction of new grasses on Molokai.

Astrebla pectinata: Mitchell grass. This is one of the best of the Australian native grasses, where it is prized as a fattening grass even when dry, and it is also cut for hay. Mr. A. W. Carter introduced this grass here and I have found it in its second year of growth probably the best drought resisting grass we had on the ranch; I could not find a single plant killed by the drought of 1906, and though the leafage dried up, even those stems that had shed seed remained green, and it was like self-cured standing hay. It would therefore be an invaluable grass to have over the pastures, but the difficulty will be to establish it. The planting I refer to was plowed and prepared land kept clear of stock. Its growth there was not rapid, and it did not seed heavily. I have not results from scattered seed, though these may show up later.

I believe, however, that it would pay to establish a paddock of this grass and to give it a good trial in the interests of the very dry country.

GRASSES FOR THE MIDDLE COUNTRY BORDERING ON THE DRY LANDS.

Danthonia: New Zealand oat grass. I sowed *Danthonia semi-annualaris* in the first months of 1901 and patches of it are to be found on various sections and it seems to be spreading. *Danthonia pilosa*, which is the better grass of the two, was sown in 1904 and it has made a good showing, growing quickly, seeding freely and keeping alive on very dry country through the drought of 1906. In fact it stood the drought as well as *Paspalum dilatatum*.

These Danthonias, natives of New Zealand, have come much into prominence there in the last few years and I was astonished to see on my recent visit, second class land where the better grasses could not be got to make a good growth, carrying a splendid stand of these grasses. This was accomplished by judicious stocking and careful use of fire. At certain seasons the Danthonias carry fire readily, and they grow and spread more rapidly when burnt. The firing of the land is also a great preventive of intestinal worms that are so troublesome in sheep and horses.

The Danthonias are working wonders on the second and third class land in New Zealand and I am sure would do a great deal for the pastures here; if sown at 800 feet elevation and upwards, where there is not too heavy a growth of the coarse grasses. The seed heads when ripening have a high feeding value and sheep and horses will go over and pick them off and fatten. I saw beautiful lambs raised on Danthonia pasture and the wool from grown sheep on lands under these grasses fetched a high price, perhaps on account of the habit of the grass to grow throughout the year.

Eragrostis brownii, another Australian grass, fills a place on the poorer land, but though it is still growing here from sowings I made in 1901 it has not spread to any appreciable extent.

Bromus unioloides: Rescue grass, is one that has shown itself well adapted to the uplands and regions bordering on the dry country, in which latter place it only grows as an annual. As I remember it in New Zealand it would not stand heavy stocking

but cut well as a fodder. It is at present popular in Australia as a drought resisting pasture grass and stands stocking with care.

Sporobolus indicus: Smut or Rat-tail grass, also thrives on the same class of country and stands more drought than the other. In my early days in New Zealand I remember this grass having full possession of large tracts of second class land. It was improved by annual burning. The chief objection to it was its toughness, which was hard on the animals' teeth. On my recent visit I found it had largely died out, giving place to the Danthonias, and other grasses. Mr. Jared Smith informs me that it is a native of these Islands.

Bromus inermis: Smooth or Hungarian brome, which has been confounded to some extent here with Rescue grass, I had little success with.

Tricholaena rosea: Natal red-top, is a useful grass growing luxuriantly and seeding heavily in the early part and at the end of the wet season. It stands drought fairly well, but heavy stocking is hard on it.

Stenotaphrum americanum: Buffalo grass, has been in the country for a long time, and has not been given the attention it deserves. I have lately seen some fine fields of it on Mr. G. N. Wilcox's place at Lihue, Kauai. It was planted at intervals on plowed land and quickly covered the surface, and is greedily eaten by the stock. I have seen patches of it on Molokai that were gradually crowding out the thicket manenie. This grass is a favorite in the warm parts of Australia and resists drought fairly well.

Opuntia Tuna. When Luther Burbank accomplishes the full evolution of his spineless cactus, or the Hawaiian ranchers work up the one they have here, there will be another valuable stock food for the dry season. Paddocks of this could be grown in the vicinity of the kiawe forest, and the fattening stock changed from one to another.

GRASSES AND FODDERS FOR IRRIGATION PURPOSES.

Alfalfa. I perhaps need hardly say that this fodder has done phenomenally well under irrigation on rich land. Mr. D. P. R. Isenberg, at Waialae, has raised a great many crops a year from

it. I tried it on open country with little success, and also Japan clover. The latter only growing one year.

Panicum molle: Para grass, or panicum grass. This was introduced by Mr. Albert Koebele from Fiji in 1902 and was very soon distributed over the islands. It is a good pasture grass and a good drought resister, but it does not seed well under grazing and the runners are too slow in taking hold of the ground for it to spread in the pasture. It is useful to cut as fodder, making a very rapid growth. It is unfortunate that this grass has become generally known here as "panicum," there being so many species of panicum.

Panicum maximum: Guinea grass. This is also a useful grass to grow under irrigation and liberal fertilizing, as a feed crop to be cut and fed to the stock. It grows with great luxuriance under these conditions, but does not stand heavy stocking in the pasture.

GRASSES AND FODDER PLANTS FOR HIGH LANDS.

Dactylis glomerata: Orchard grass or cocksfoot. *Lolium perenne*: perennial rye grass. *Holcus lanatus*, mesquite, velvet grass, or Yorkshire fog. These three important grasses were first tried on the Molokai ranch in 1901, though their record on the Islands dates much further back. If not over-stocked these grasses will spread and take up new land on the mountain moist country and I believe have made an even better showing on the other Islands. I saw as fine a field of rye grass on the Parker ranch as I have seen in New Zealand. Orchard grass grows well and seems to spread and will stand more drought than rye-grass, but is coarser and not of so much value as a fattening grass.

Fog or Mesquite, as it is known here, is a very persistent grower and spreader in the wet country and I believe has proved a good pasture grass on some of the Maui and Hawaii mountain ranches. It is thought little of in most parts of New Zealand, but I believe in parts of France it is valued and constitutes the bulk of the pasture in places. No one with mountain ranches can make a mistake in sowing these three grasses.

Anthoxanthum odoratum: Smut vernal. This makes a wonderfully strong and early growth on the wet regions on Molokai. In other countries it is not considered amongst the finest of

grasses, yet from its habit of growing on the poorest land and the fact that it grows extra strongly here it may fill a place on mountain pastures.

Poa pratensis: Kentucky blue grass. *Poa annua*: Annual meadow grass. Are both worthy of being included in upland mixtures. They have done well on these Islands.

Festuca elatior: Tall fescue. I sowed this grass in 1901 and it made a strong growth on the mountain, I obtained the seed as Chewings fescue, a New Zealand hybrid, and was only undeceived on my last visit to New Zealand where I found Chewings fescue a much finer and shorter grass, and tall fescue not usually a popular grass on account of its very rank growth on wet land and its tendency to develop ergot. I have since seen it strongly condemned.

Agrostis alba: Red top. This is a fine grass and has done well on the moist country; I found it very much in evidence in the pastures in New Zealand.

I had little success with clovers. Crimson and red clovers seeded but died out, and alsike and trefoil were alike unsuccessful. Mr. Louis von Tepsky successfully established white clover on Maui, having sown it with a number of others some 20 years ago. I grew some plants of tree lucerne, a bushy shrub growing about 10 or 12 feet high. It seeded but sparingly and eventually the trees died. Whether it would be worth planting or not I do not know.

Timothy was an entire failure in all my trials.

CULTIVATED FEED CROPS.

Whether it will pay to cultivate land and grow catch crops may be somewhat doubtful, unless under a system of dry culture, by sowing the seed with the last heavy rains and having the crop growing in the dry season.

I sowed about 10 acres of dwarf Essex rape in November, 1905, having tried a small patch the year before. Though much too thickly sown and attacked by cut-worms and aphides, in seven weeks it was high enough almost to hide the four months old lambs I had in it. These lambs thrived splendidly and never missed their mothers, till by excessive dry weather in January and February the rape all wilted up. It sprouted again with the March rains when it was cut and fed to the hogs. Having sown

Rhodes grass with it and finding the lambs too hard on it whilst young, I did not put them in again. If the rape had been alone and the harrows had been run over it when wilting it might have revived it as the lambs trod the surface smooth and the moisture was thus more readily lost.

"Thousand headed kale" is grown for the same purpose as rape and resists the drought better and would probably do better here. Rape is considered the best fattening food for lambs and is very much grown for this purpose in the colonies in finishing fat lambs. My object in planting it was to try and to keep the Honolulu market regularly supplied with fat lamb. It is also good food for almost any farm animals. From one to seven pounds of seed should be sown to the acre. I think there is a great field here for experiment with crops of this kind such as field peas, carrots, turnips, Egyptian and Kaffir corn, soy beans, etc., etc.

I sowed about half an acre of cow pumpkins and they struggled hard against the drought, but only a small crop was harvested. They are also very good food for any farm animals, and useful as a vermifuge. If crops of these kinds can be grown and the plow kept more at work it will serve to minimize the plagues of internal worms that at times visit the horse and sheep ranches.

In dividing these grasses and plants into mountain, middle, and dry country, there can be no hard and fast line. Some will have a range from the frost line to the very dry country as Paspalum dilatatum and Rhodes grass, and most of the middle grass will eventually spread to some extent into the dry country and the mountain grasses into the middle lands.

I think it better to start the dry country plants, except those preferring salty land, on the borders between the middle and the dry country as they will then spread on to the dry country. I would also advocate, as is practiced in some parts of Australia, to plow and sow the seed in long narrow fenced strips of land on the boundaries of pastures and at right angles to the prevailing winds. In this way there will be a chance of the grasses becoming established in the adjoining pastures. Sowing seed on the very dry country is almost useless unless one has quantities of it.

The middle land grasses can be sown on the surface fairly high up on the middle country, but not in the thick pilipili-ula and manienie. The wet country grasses can also be surface sown and will take well if the other growth is not too thick.

A great deal has been done in establishing mountain grasses in the past. Mention was made of this fact at the Stock Breeders' meeting in 1903, by Mr. L. A. Thurston. Mr. Jared G. Smith also mentions that he found a large number of foreign grasses on his travels over the islands.

With the dry country the proposition is a much more difficult one, but I have no doubt that in the future there will be as great and probably a greater development in these lands as there has been on the wet lands in the past.

I have not enumerated the grasses which I failed to grow, as other trials under different conditions and soils might be successful. I think that experiments should be conducted on every ranch, not necessarily to go to any great expense. A good fodder plant may be discovered now and again that would be of immense value to Hawaiian ranchers.

LOCAL NOTES.

Dr. Duerden, formerly Curator of the Museum in Jamaica, who spent the summer of 1906 in the Hawaiian Islands studying the marine fauna, is at work arranging an agricultural course for the Rhodes University College, South Africa, where he is now Professor of Zoölogy.

The Hawaiian Planting Company, Limited, of Hilo, has recently filed its articles of incorporation. The new company is organized to plant, grow and raise fruits, and to manufacture, distil and prepare products of the soil into commercial and trade articles. The capital stock is \$4,000, divided into 800 shares of \$5 each. Its officers are: John K. Kai, president; J. K. Kelii-kahi, vice-president; C. K. McGuire, secretary-treasurer; A. K. Hapai, auditor, and P. A. Victor, T. K. Lalakea and Charles Williams, directors.

The output of the Hawaiian Pineapple Company's cannery at Iwilei, Honolulu, for the past season amounts to two and a quarter million cans. The cannery at Iwilei is the largest in the world, which is the more extraordinary in view of the comparatively recent establishment of the company. Already plans are being drawn up to double the present capacity of the machinery.

BOARD OF AGRICULTURE AND FORESTRY.

DIVISION OF ENTOMOLOGY.

PRINCIPAL CITRUS INSECTS IN HAWAII.

BY JACOB KOTINSKY.

(Continued from May "Forester.")

"SNOW SCALE" OR "ORANGE CHIONASPIS."

(That is *Chionaspis citri* Comst.)

This species of scale bug has not hitherto been recorded from these islands. It was found in but one garden in Honolulu, but its identity is unmistakable and because of its destructiveness to citrus trees in Florida and elsewhere, attention is here called to its appearance.

The female scale.—To the ordinary eye this looks so very much like the purple scale as to be indistinguishable. But it is thinner, considerably broader in proportion to its length and is distinctly ridged along the entire length. In other respects it is quite similar to the purple scale. The presence of this insect upon a citrus tree is, however, readily recognized by the

Male scale.—This is snow white, and as it usually occurs in large numbers, gives the infested tree a rather striking appearance—as if it were white-washed—hence the "snow scale." We have other "snow scales" in Hawaii but none of them were so far observed on citrus plants.

In habits and behavior it is so much like the purple scale that it is unnecessary to dilate here. This applies also to the remedies prescribed for the purple scale—they are equally effective against the orange chionaspis.

FLORIDA RED SCALE (*Chrysomphalus aonidum* L.)

This scale insect is very common on all the islands on a larger number of plants, including the citrus group. It is seldom numerous enough to do serious injury, but is frequently sufficiently numerous to attract attention. Being almost perfectly

circular in outline and dark in color it is strongly contrasted by the green background of the plants it inhabits, and made conspicuous in consequence. The younger stages and particularly the male scales are frequently found perforated near the center, indicating the exit of a parasite, which probably prevents the scale from becoming unduly numerous. The common name does not indicate its origin for, as a matter of fact it is of world-wide distribution. It flourishes most in damp atmospheres, hence its abundance in Florida, Louisiana, and on plants confined in greenhouses. Its native home is at present unknown and it is doubtful whether it will ever be discovered.

The female scale.—The substances composing this scale are identical with those of the purple scale, though it is less thick, circular in outline and the molts lie in or quite near the center. It is dark brown in color, almost black, the central portion being lighter and bearing a nipple-like appearance. When the scale is raised by means of a pen knife or other fine point the wingless, lemon-yellow insect sometimes surrounded by eggs, empty egg shells, or crawling young, remains attached to the host.

The male scale is almost exactly like that of the female in structure, but is much smaller, somewhat elongate, and bears but one molt near the center.

The female always remains adhering to the host when the scale is raised and is seen to be a yellow, shiny, legless, wingless, semi-globular sack, held fast to the host by the long threads that constitute its proboscis or beak.

The male differs little from most of the males of this group in either development or appearance.

MEDITERRANEAN SCALE (*Parlatoria ziziphus* Lucas.)

This is the small black scale usually occurring in large colonies upon leaves, fruit and stem of citrus plants on these islands, especially on what is known here as the "Chinese orange." On no other variety of the citrus group can it be regarded as a serious pest.

The female scale is flat, elongate, and composed almost entirely of the black, rectangular second molt. The first molt lies in front of this, overlapping it about half of its own length, and is also opaque black.

The male scale is also elongate, yellow or brown in color except the single molt skin which is black.

This insect is common on citrus plants and fruit in the countries bordering on the Mediterranean sea, whence it is supposed to have been distributed to other citrus growing countries in the world. It is also common in the Orient whence it must have reached these islands. Now that the importation of citrus fruits from the Orient into these islands is prohibited, very little of the pest reaches this country, and none alive, since all infested fruits and plants are either fumigated, destroyed or returned.

NOTES.

The price of camphor is at present remarkably high, and a great extension of the planting of camphor trees is already in progress in Ceylon and other countries.

The artificial production of camphor has been rendered remunerative by the present price of the natural drug. A fall in the market would render the synthetic manufacture unprofitable.

The exports of rubber from Trinidad are rapidly increasing. The prices obtained for Castilloa sheets average nearly one dollar per pound.

A rubber producing tuber has recently been discovered in Portugal West Africa. The tuber is turnip shaped and yields its lac upon compression. Coagulation is produced by means of alcohol. It is said that 180 pounds of rubber per acre can be produced from this new source in two years.

The unprecedented coffee harvest in Brazil this season has rendered it necessary to withhold a proportion of the crops from the market in order not to cause the ruin of many planters.

The export of ostrich plumes from South Africa is valued at about seven million dollars per annum.

*RECENT PUBLICATIONS.***THE OPEN-TANK METHOD FOR THE TREATMENT OF TIMBER.**

A marked saving in three directions—cost of equipment, of materials and labor, and of transportation—is being effected by the introduction of what is known as the “open-tank” method of treating timber. The general practice of preserving timber has hitherto been retarded by the heavy cost of closed retorts and other complicated equipment ordinarily used and the need of experienced men to operate them. Not until the kinds of timber long used and considered almost indispensable for certain purposes grew scarce and rose alarmingly in price did wood users consider seriously the possibility of consuming less wood by making it last longer.

As a rule preserving plants have been located at lumber centers, where a large business might be expected, and it has often been necessary to pay transportation charges to and from the treating plant on timber needed for local uses, such as for ties, posts and poles. The equipment of the open-tank method, which consists of an open tank, capable of withstanding heat and either equipped with steam coils or so arranged that fire can be placed underneath, is so simple and comparatively so cheap that it is within reach of the smaller companies, contractors and farmers. The fact that it is portable gives it a distinctive value, since it can be taken, if necessary, into the heart of the forest, and even into the mountains.

One of the chief advantages of the open-tank process is that it can be effectively applied to parts of timbers which are especially subject to rapid decay, such as the butts of fence posts and telephone poles, without wasting preservatives on other parts. It is also especially adapted to the treatment of mine props, small dimension timbers, cross-ties, piling, and shingles, and timbers in small sizes of loblolly pine, black and tupelo gum, western yellow pine, and lodgepole pine, and similar kinds of wood. Fairly good results have been obtained in the treatment of arborvitæ, chestnut, and red oak, but the experiments thus far do not warrant the application of the method to the treatment of piling and ties made of these woods.

The open-tank treatment is being rapidly developed, and while it ordinarily does not secure so deep a penetration of the chemicals as the retorts it is sufficiently thorough to protect timber

for practical purposes in many situations, and it is probable that future experiments will further extend its application.

Circular 101, just issued by the Forest Service, United States Department of Agriculture, describes and illustrates the open-tank equipment. It can be had upon application to the Forester, United States Department of Agriculture.

SUGGESTIONS FOR FOREST PLANTING ON THE SEMIARID PLAINS.

The Forest Service has just issued a circular devoted to the interests of forest planters in the western portions of Kansas, Nebraska, and Oklahoma, northwestern Texas, eastern Colorado, and New Mexico.

This entire region is practically treeless. Here and there, of course, trees have been planted, but forest planting has in no way kept pace with agricultural development. There is real need for forest growth. By careful selection of the species, the choice of suitable sites, and proper management of plantations, enough forest can be grown to exercise a marked effect upon farm development and to supply wood for most domestic purposes. The object of the circular is to show just what it is practicable to undertake in the way of such plantations. Planting may be done for any one of three chief purposes—protection, wood supply and shade.

A windbreak consists of one or two rows of trees planted primarily for the purpose of checking the force of the wind. The term "shelter-belt" is applied to larger groups of trees which form forest conditions and serve a protective purpose. Any species which is adapted to the region may be used for wind-breaks. Where evergreens will succeed, however, they are more desirable, since they afford better winter protection than deciduous trees. A windbreak consisting of a single row should be composed of a densely growing species with branches close to the ground.

The main use of windbreaks is to shelter an orchard or a residence site, to prevent hot winds from scorching field crops, and to conserve soil moisture within the protected area. They may also be planted in open pastures for the protection of stock. Incidentally, the windbreak may furnish useful material, but it must be placed where it will afford the most effective protection, without much reference to the character of the soil.

Wherever agriculture is practiced in the plains region, the farmer will find it profitable to devote a few acres of good land to trees. It is true that some time must elapse before the plantation will become productive, but, by the choice of rapid growing species and by close spacing, the thinnings which will be necessary in a few years will provide material suitable for fuel, stakes and the like.

The choice of species for this purpose is naturally very limited and will depend somewhat on the location. Trees that grow rapidly and at the same time produce wood of good quality are best. If they also sprout from the stumps, the forest may be made permanent with a little care.

The pamphlet contains suggestions as to the choice of species, with notes on their requirements, and directions for planting and care. It constitutes Circular 99 of the Forest Service and may be obtained of the Forester, U. S. Department of Agriculture.

YEARBOOK OF THE U. S. DEPARTMENT OF AGRICULTURE, 1906.

The Yearbook contains the annual report of the Secretary of Agriculture, 120 pages, and thirty miscellaneous papers, 332 pages, covering a wide variety of subjects thoroughly representative of the varied scientific work conducted by the Department. Also an Appendix, 241 pages, and Index, 26 pages. The Appendix contains lists of names and post-offices of persons prominent in agricultural work in all its branches, including a statement of the Department organization with the names of the persons in charge of the several branches of work. It presents summaries of agricultural observations in several fields of legislation on forestry, roads, and game protection, and a statement on the Federal meat inspection law with a review of the animal industry work, unusually full. It closes with the annual statistical tables covering production and prices of the principal crops and farm animals, and the imports and exports of agricultural products. A new feature is a table of cotton production, domestic consumption, and exports, from 1790 to the present, and of prices from 1869.

FARMERS' BULLETIN 294.

Farm Practice in the Columbia Basin Uplands. By Byron Hunter, Assistant Agriculturist, Farm Management Investigations, Bureau of Plant Industry. Pp. 32, figs. 9.

A description of the uplands of the Columbia Basin, the methods of tillage in use by the farmers of this region with the relative merits of the different methods, and a study of the varieties of wheat grown and their adaptability to the different sections.

FARMERS' BULLETIN 295.

Potatoes and Other Root Crops as Food. By C. F. Langworthy, in Charge of Nutrition Investigations, Office of Experiment Stations. Pp. 47, figs. 4.

A summary of information concerning the composition, digestibility, and nutritive value, etc., of potatoes, artichokes, tropical starch-bearing roots, succulent roots, tubers and bulbs, and roots used as condiments.

FARMERS' BULLETIN 296.

Experiment Station Work, XLI. Compiled from the Publications of the Agricultural Experiment Stations. Contents: Weils and pure water—Phosphates and soil acidity—Pure seed v. poor seed—Disease-resistant clover—Eradication of wild mustard—Sterilization of soils for preventing plant diseases—Seedless tomatoes—Pickling olives and mock olives—Hay box or fireless cooker—Insect enemies of shade trees—Feeding whole grain—Improvement of cattle—Ventilation of stables—Hog cots—Preserving eggs—American Camembert cheese.

FARMERS' BULLETIN 297.

Methods of Destroying Rats. By David E. Lantz, Assistant, Bureau of Biological Survey. Pp. 8, fig. 1.

This bulletin is issued in response to numerous calls for practical methods of destroying rats. It contains descriptions of different methods of poisoning, trapping rats, the use of ferrets and dogs, and fumigation, gives a list of their natural enemies, and suggests means of excluding them from buildings.

FARMERS' BULLETIN 299.

Diversified Farming under the Plantation System. By D. A. Brodie, Assistant Agriculturist, and C. K. McClelland, Scientific Assistant, Farm Management Investigations, Bureau of Plant Industry. Pp. 16.

This presents a discussion of the advantages of diversified farming over the one-crop system, with an account of an experiment in diversified farming on a plantation in Louisiana in 1906.

FARMERS' BULLETIN 300.

Some Important Grasses and Forage Plants for the Gulf Coast Region. By S. M. Tracy, Special Agent, Farm Management Investigations, Bureau of Plant Industry. Pp. 15, figs. 5.

This bulletin discusses the use of Mexican clover (purslane), beggar weed, velvet beans, guinea grass, and Para grass as forage plants, and gives directions for handling them.

FARMERS' BULLETIN 301.

Home-grown Tea. By George F. Mitchell, Scientific Assistant in Tea Culture Investigations, Bureau of Plant Industry. Pp. 16, figs. 4.

Directions for soil selection, planting, cultivating, picking, and curing of tea for home use, with suggestions on preparation for the table.

The above Bulletins may be obtained free by application to the Secretary of Agriculture.

BULLETIN 188, IRRIGATION IN THE YAKIMA VALLEY, WASHINGTON.

This bulletin, by S. O. Jayne, contains a description of the canals used for irrigation in the Yakima Valley, Washington, with statements of cost of construction and operation, methods of construction, methods of using water, and forms of organization for canal companies. It contains, also, data on methods and cost of preparing land for irrigation.

BULLETIN NO. 181, MECHANICAL TESTS OF PUMPING PLANTS IN USE FOR IRRIGATION IN CALIFORNIA.

This bulletin gives results of mechanical tests of a large number of pumping plants in use for irrigation in the vicinity of Pomona, Cal., and of a few of the large plants used for drainage in the Sacramento Valley, California. It contains also statements of fuel consumption and running expenses. It is written by J. N. Le Conte and C. E. Tait.

Application for above bulletins should be made to the Director of the Office of Experiment Stations, Washington, D. C.

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NOTICE FROM THE DIVISION OF ENTOMOLOGY

The Entomological Division of this Board wishes to inform Hawaiian readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

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No. 10

RUBBER CONVENTION.

On Saturday, October 12, the first Rubber Convention ever held upon American soil took place at the Nahiku Rubber Company's plantation on Maui. A representative gathering of those engaged in the new industry was present, as well as a number of the important official and business residents of the Territory.

A specially chartered steamer left Honolulu the previous Friday, carrying about thirty members to the convention. At Lahaina and Kahului others joined the party, which numbered about sixty in all when Nahiku was reached the following morning.

RUBBER TAPPING.

Early in the day Mr. Bradford of the U. S. Experiment Station, gave a practical demonstration of tapping. During the experiment the operator explained the various processes connected with drawing off the latex and its collection and coagulation.

RUBBER ON MAUI.

The cultivation of rubber has been engaging the attention of a small number of growers in the Nahiku district of Maui for some years past, but it was not until 1905 that the first company was formed to devote itself solely to the production of rubber. Other vigorous companies have now entered the field, until now the Nahiku Rubber Company, Hawaiian-American Rubber Company, the Koolau Plantation, and many private growers, among whom Messrs. W. G. Scott and F. Wittrock are prominent, have between them nearly half a million rubber trees in cultivation.

Of these many thousand trees will be ready for tapping early next year, and from that time, rubber will, without doubt, figure more and more prominently in the exports of the Territory.

Although the Hawaiian Islands are theoretically not ideally situated for the growth of rubber, there is now every indication and assurance that they are about to enter the list of rubber-producing countries. The outlook is a most promising one, not only to those immediately concerned in the industry, but to the community at large, for with the successful establishment of this lucrative industry in the islands will come a measure of general prosperity to all. The recent development of the pineapple industry has been both rapid and thorough and the promises for its future enlargement are such that within a very short period the exportation of canned and fresh fruit will be multiplied manifold. Yet, however rapid has been the growth of this industry, the prospects before the cultivation of rubber appear more promising and we predict within a few years the establishment of a number of plantations whose combined capital and influence will be second only to that of the sugar growers.

The first speaker at the convention was Mr. Jared G. Smith of the U. S. Experiment Station, who in part said as follows:

OCCURRENCE OF THE LATEX.

"Rubber, in the condition that it is found in the plant occurs in the tissues. In the Ceara it exists in a network of cells not directly connected. That is, it is the opposite, for instance, to the arrangement of the blood in the human system. If the arm should be cut from a man he would bleed to death, but when you break a branch off a rubber tree the tree does not necessarily die. There is a certain connection, but it is not a close one. If a rubber tree should be cut down you would by no means get all the rubber from it. The latex from only a small area would be withdrawn.

"The rubber in a plant seems to be placed there for the purpose of preventing evaporation of moisture and to stop up wounds which would otherwise cause trouble and possible damage to the tree. There certainly is rubber in many trees in Hawaii and it seems to me that there should be a great deal of success in the growing of rubber trees here.

LOCAL EXPERIMENTS.

"At the Experiment Station we have been making a number of preliminary experiments which we hope will be of use to the rubber growers both here and elsewhere. One of these you have seen this morning in the tapping of trees. There is still a great deal more to be done and we are going ahead with it.

"From what I have seen of the Ceara trees in this country it stands just as well and in some cases far better than anywhere else. The treatment of the trees is a matter which can best be worked out by those actually in charge of the work. The theory is that one should get the most wood that is possible in healthy trees which have, at the same time, been grown in the shortest length of time and at the least expense. That is, the trees should be forced as much as is possible. I repeat that I believe that the best way that this can be determined is through the efforts and observations of those who come in contact with the actual work here on the plantations."

Dr. Waterhouse was now called upon to address the meeting. His paper contained a comprehensive account of the cultivation of rubber and is given here in full:

The general sources of rubber are:

I. WILD RUBBER.

This has been and still is the main source of the world's rubber supply. This rubber comes mainly from the Amazon region, coming chiefly from the species *Hevea Brasiliensis*, which, taking its name from the port of Para from which it is shipped, is called "Para Rubber" and is the standard rubber of the world. Also much sapium rubber—an inferior grade—comes from this locality.

The "Ceara" wild rubber comes to the market in the form of scrap, as the bark is shaved off the wild trees and the coagulated latex removed from the sides of the trees. There has been no attempt at collecting the latex from the wild trees, probably from the fact that the latex coagulates so quickly on exposure to air.

Next to South America, Africa produces the largest amount. This is inferior to the South American product and comes chiefly from vines such as the *Landolphias*, and from root rubbers; also from the *Funtunia elastica* and *Kihexia elastica* trees.

Considerable wild rubber comes from Java and India, and from the South Sea Islands, mainly from *Ficus elastica*, or the red rubber of commerce. Also there is wild *Castilloa* from Mexico and Central America. Guyale rubber comes from a shrub growing mainly in Mexico. Contrary to the supposition of many, though this is only a shrub three feet high, it is very slow growing, most of that used at present to manufacture rubber being twenty or thirty years old. From the first year, when only six inches high, it flowers and seeds. Up to the third year it contains no rubber at all, and from the third to the eighth year the percentage of rubber is small and it is only fit for use when eight years old. The quality is inferior. The available supply will only last four or five years and then the supply will be exhausted. It will therefore help to fill the supply until more plantation rubber can take its place.

II. FOREST PLANTED RUBBER.

Rubber planted in the forest to supplant the wild trees and vines of the forest. There is considerable of such planting going on in Africa and there will probably be much more now that the Ryan Syndicate has taken over Congo Free State Concession.

III. PLANTATION RUBBER.

Next comes plantation rubber, which can easily compete as far as the cost of production goes, with the other two classes, and with the increasing knowledge as to its preparation and the consequent increase in the lasting power of the rubber, it is destined eventually to crowd out the other two forms if a low price brings them into a life and death competition.

There are, as is well known, a number of different varieties which are being cultivated in different parts of the world, being mainly the *Hevea* or *Para*, the *Ceara* or *Manihot Glaziovii*, the *Castilloa*, and the *Ficus elastica* or *Rhambong*.

HEVEA BRAZILIENSIS.

Of these the *Hevea Braziliensis* is probably the most important. Its cultivation has been highly successful in Ceylon and the Malay States and it has had far more thought expended on it and its culture has reached a far higher point than that of

any other variety. For the last twenty years or more scientists in the admirably conducted Botanic Gardens of these localities have been putting time and thought on the various problems in regard to the Hevea. This has gone hand in hand with cultivation on a larger and larger scale so that planting, care of the trees, collection of the latex, and the production of rubber, has been reduced to a science; the fact of its increasing yield from year to year in spite of, and even stimulated by, tapping has been demonstrated. Cost of collection, market price, etc., all have been reduced to a business basis; though there are improvements every day.

CEARA.

With the Ceara things are quite different. Ceylon has just awakened to the value of this variety and it is only now that trees are beginning to be tapped that were planted many years ago. Malay peninsula never took up this variety. Central America plantations are just beginning to tap. Hawaii thus has a chance to be in the van in regard to solving of the problems presented by this variety. At present Ceylon is a novice in regard to tapping Ceara, but in two or three years when our plantations are coming into bearing here, they will have had more experience with that variety there and will probably be of service to us. However, we should solve many of these problems ourselves and have a chance to be "leaders" in regard to this variety.

This variety certainly has its own distinctive problems. Such as handling of the outer bark, after the first tapping, the rapid coagulation of the latex on exposure to air, etc., etc. First tappings are so far as they have advanced in regard to Castilloa on a large scale. So that, take it all in all, the rubber growing industry is still in its infancy.

Briefly, we will take up some of the questions to be answered in any variety with the experience elsewhere:

METHODS OF PLANTING.

1. *In Nurseries.*—This is the most successful way in regard to the Hevea. Subsequently the nursery plants are planted out as seedlings or stumps. Some have used baskets for seedlings, but this has been given up. Planting stumps, however, has proved the best method. There has been some talk, I believe, of

planting this year's Hevea seeds in Nahiku in baskets, but I think planting in a clean weeded nursery in a warm locality and then stumping those that have grown very well, would be best. They can remain even one or two years in the nursery, if necessary, in this way, though probably the next spring would be a good time.

2. *At Stake*.—Insects, rats, etc., are very troublesome when this is done. This method is very successful in Castilloa, however, when seeds are cheap and a number can be planted together and one plant used.

DISTANCES IN PLANTING.

This is a most important subject and one on which there is a very great variety of opinions.

There are great variations. Trees are planted all the way from 10x10 or 400 to the acre, to 20x20 or even 30x30. 15x15 or 200 to the acre is considered medium planting. Many plant closer along the rows and with wider distances between the rows, as 10x10 and 20 feet between the rows, or 15x15 and 20 feet between the rows.

However, it may be said that the general trend of opinion in the Malay peninsula and Ceylon is towards wider planting and more room for the trees.

CLOSE VERSUS WIDE PLANTING.

In general, it may be said that close planting is more suited to poorer land and wide planting to more fertile land. The plan of planting closely with the idea of, in the early years, cutting out alternate trees, has not been found to be very successful, as they have to be cut out before they are old enough to pay for themselves or much more than do so, and in cutting them out branches of the other trees are damaged and theoretically there is more danger of disease from the stumps, etc. One argument for wide planting is shown in the results on the highlands and lowlands estate in the F. M. S. as cited by Ivos Etherington. A block of Para rubber trees 16 acres in extent contains 807 trees planted 30x25 feet. These are nine years old and completely cover the ground. Over the whole estate the year's crop amounted to 95,333 pounds from 33,967 trees tapped all through the year, and 4,672 lightly tapped. The average yield is 2.46 pounds

per tree per year; but from 807 widely planted trees the yield during the year was 5,742 pounds of rubber, giving an average of 7.05 pounds per tree. Of course, this is not conclusive as the bulk of the trees were of all ages, though many of them were nine-year-old trees.

CEARA TREES.

That our Ceara trees planted 400 to the acre will have to be thinned out eventually there is no doubt. However, by having the first tappings made on alternate trees, skill in tapping and experience can be acquired by tapping the trees which will eventually be cut out before the alternate trees are touched, which can be allowed to grow considerably larger before being tapped.

However, in these plantations at Nahiku, which have a considerable number of their trees planted 400 to the acre, it would seem advisable to plant, if not the rest of their acreage with 200 trees to the acre say, at least enough to be able to judge later which proved to be the best method. One distance in planting should not be adhered to exclusively when in the development stage.

When countries where it costs almost nothing more to have 400 to the acre because the place is clean-weeded anyway, consider 200 to the acre moderate distance, it seems as though where it is considerably more expensive to plant so many trees as it means so many more trees to clean a circle around, that in this case, I say, it might be wise to have part of the planting at least with greater distances and more room.

From the shape of the trees, one would imagine that a Ceara tree having, when well shaped, such a dome-like expanse of leaves, would need even more room than the Hevea. The thickness of the trunk is dependent on the number of leaves and the sunlight that gets to them. With this object in view, some planters thumb prune their young trees, removing the terminal bud when the sapling gets to be 10 feet high or over. This gives rise to two branches, which, after being allowed to grow a short distance, are again thumb pruned, etc. This greatly increases the leaf area and a consequent increase in girth of the trunk results.

CASTILLOA.

With the Castilloa they do differently, planting a number of seeds on hillocks close to each other and gradually thinning out by experimental tappings until they obtain the desired number per acre. However, this is necessary in Castilloa, as many of the Castilloa do not give latex, whereas in Heveas and Cearas in the right localities and particularly with Heavas, there is a marked uniformity. Often with Castilloas, even with this careful selection, barren trees or those which soon become so, are left occasionally.

WEEDING.

There is no doubt that clean weeding is best, though expense may prevent it being carried out.

TAPPING.

This is of course most important, and here the greatest advances will come, next to the preparation of the rubber after collection of the latex.

For Hevea, various tapping tools have been devised, with the main object of not cutting into the cambium or growing part of the bark. It matters not whether the single V, the herring bone, modified herring bone, spiral or what the incision made, the sumnum bonum is to get the greatest amount of latex with the least loss of bark and the least injury to the cambium.

If the cambium is uninjured or left in strips on the bark new bark will grow up. It has been found best not to tap this new bark the next year, but in two years it can be tapped again though normally it may not be necessary for a longer period than that.

There is another factor bearing on the subsequent yield of the tree and that is that the tree suffers from shock when the latex is removed in a large amount which is minimized by the system of multiple tapping to which the Hevea variety lends itself so admirably, and in fact this is one of the things which have contributed in giving it the power of yielding in larger and larger amounts when tapped year after year.

The Ceara promises to do likewise and it is up to us to demonstrate it. The Castilloa yields all at one time and in large quan-

tities there being much less rubber in the latex according to the coagulation and preparation. The Hevea latex is coagulated in various ways, but most often by acetic acid. The rubber is shipped in pancakes or run through a machine giving crepe rubber or as worm rubber, or best of all, crepe rubber is blocked under pressure so that little of the surface is exposed. In Castilla the rubber is creamed off after mixing with water.

SPECIES FOR HAWAII.

As to the variety growing here Ceara grows most luxuriantly and in proper localities seems to yield extremely well. Hevea grows very slowly and may not yield at all. If we can raise enough Hevea to have our own seed supply, then, if it is going to pay we can plant up Hevea in place of the Ceara, though we may find it to our advantage not to do so.

As to quality Hevea and Ceara are about on a par.

ACREAGE IN RUBBER.

There is no question of the tremendous amount of planting going on—250,000 acres in Ceylon and the Malay States, 90,000 acres planted in Mexico. Plantings in Borneo, Java, Samoa and many South Sea Islands. Planting in Central America and Africa, and in fact all over the tropical world. But on the other hand we planters see that side of the question as the largest. Some cry over-production; on the other side are the manufacturers saying we never can have too much rubber. The consumption is doubling every ten years and there are new uses every day.

PRICE OF RUBBER.

Think of the increase of the automobile trade. Probably, however, the result will be that there will eventually be a considerable reduction in price after a few years which will multiply the uses of rubber and keep up the price. If we can produce it for 30 or 40 cents a pound, it will be profitable for many years to come.

RUBBER PESTS.

Mr. L. A. Thurston now read a paper by Mr. Kotinsky on rubber pests. This paper is included in this issue and forms a separate article.

Mr. C. J. Austin, who was now called upon to address the meeting, spoke in part as follows:

NO DANGEROUS PEST IN HAWAII.

"In the Territory of Hawaii the rubber planters are unusually fortunate. There are a few insects which will need some care, but I believe that I can say that in every case we have at hand the parasite which will destroy the pest. There may be some which we do not know of as yet, but I doubt if there are any of sufficient importance to cause trouble if the trees are carefully watched.

"There is some slight indication of a fungus disease, but this troubles only the leaves and has not gone into the wood, where it would create damage to any extent. On this account, with prompt action and care I believe we are safe from trouble of this kind. There are fungus diseases extant in this Territory which attack the roots, but so far they have never attacked rubber. On the whole I believe that I am safe in saying that we are very fortunate and have no insect or disease which can be considered a dangerous enemy to our new and coming industry of rubber production."

Mr. D. C. Lindsay, President of the newly formed Hawaiian Rubber Growers' Association, at the request of Governor Frear, spoke as follows:

THE FUTURE OF RUBBER.

"The large number of vigorous and healthy rubber trees which I have seen here today have impressed me most favorably. The new industry appears to me to be most promising and I expect that it will go ahead. We are always in a matter of this kind apt to err on the side of conservatism. It is hard indeed to have faith in something that one cannot see before him, but I believe that there is a great future ahead in store for rubber growing in the Territory. Fifteen years ago there was no one in the islands who could foretell the tremendous amount of sugar which is now being raised here. If it had been predicted it would have raised a laugh. It is a common saying that a man from the country must go to the city to see wonders and learn, but from what I have seen today the reverse is true and the men from the city should come to the country.

"The same thing in the line of conservatism is true of the pineapple growers, but the exportation of the past year has opened the eyes of the people to what may be done. The best feature in both of these industries, pineapple and rubber growing is, to my mind, the fact that it is not only a business in which the capitalist may embark, but is also eminently fitted for the small farmer.

"It hardly needs imagination to see what rubber may become in this Territory. From what I can find in the figures which have been brought to my attention, it appears that if only a part of what those who should know believe to be true, comes to pass, rubber will be a far more profitable crop than sugar, and if planted in this Territory acre for acre with that product, will bring in far more wealth to our people. There are, indeed, strong grounds to believe that the rubber industry will stretch to the same extent that rubber itself will."

Mr. B. F. Dillingham, who was called on to say a few words, responded in the following manner:

A GREAT FUTURE.

"I must say that I have been surprised, to use a familiar expression, over what I have seen today. I have never known much about rubber, and to see the extent to which the growing of this product has reached has astonished me. I am optimistic by nature, unless it happens that I feel ill, and from what I have seen today I must say that I feel first-class. I believe in new industries, and my record will show that I have always done everything that I could to further them, to the extent of investing my own money and getting my friends to invest theirs. Rubber appears to me to have a great prospect ahead, and I certainly hope that everything will keep on as it has so far, and if that occurs there will be no complaint from anyone."

The last speaker called upon was Ralph S. Hosmer, of the Bureau of Agriculture and Forestry, who said:

"I am very glad to be here once more and to have an opportunity to see more of the rubber plantations, which are now nearly, if not quite, a success. The organization of the Rubber Growers' Association can not but be a step productive of good. The bringing together of the various interests in this line that they may consult, and that the one may through this benefit by

the experience of the other, is sure to help each and every one who is interested in rubber growing.

A GOOD START.

"I believe that the main hope of this Territory is in the establishment of other industries than that of sugar. The rubber growing work has received a good start, and it should go ahead, and will before we know it reach proportions which will make it not only of great importance to the Territory, but also to the entire United States."

The meeting was closed with a standing vote of thanks to the members of the association who had spoken during the day, and in particular to the ladies who had entertained the excursionists so generously and had been so careful in looking after their comfort.

LOCAL NOTES.

The report is once again brought of a large find of ambergris occurring in Hawaiian waters. The value of this marine product is very great and a block of several pounds would be a most fortunate discovery. Unfortunately, however, all of the "ambergris" which we have seen in the last few years, and which has been displayed with great ceremony by its owners, has turned out upon inspection to be some worthless composition which was not worth the pains of salvage.

A contract has recently been signed by the Hawaiian Mahogany Lumber Co. and the Atchison, Topeka and Santa Fe railroad, by which the former engage to export 90,000,000 board feet of ohia lumber to the mainland in the next five years. The transaction involves a sum of over two and a half million dollars. The lumber will be used for railroad ties, for which purpose it has been shown to be thirty per cent. better than the white oak, which hitherto has been the standard of excellency.

The shipment of the lumber will be made from Hilo and some 50,000 tons will be forwarded each year. The contract size of the ties is six by eight inches, and eight feet in length.

FRUIT MARKETING EXPERIMENTS.

By J. E. HIGGINS.

Fruit growing is destined to become one of Hawaii's most important industries. Already pineapple growing has assumed large proportions, and other fruits are certain to follow. To ascertain the best methods of marketing, including every step in the process from the gathering of the fruit in the field to its sale, is quite as important a factor in any fruit industry as that of production. To determine some of the important elements in marketing, the Hawaii Experiment Station has undertaken a series of experiments which has now covered some four years. During the present season two experimental shipments have been made with very satisfactory results.

The first shipment, in 1907, which I accompanied personally, left Honolulu, July 24th. It arrived in San Francisco on the 30th, and a part of it was trans-shipped to Los Angeles. Careful notes were made of the conditions of different lots of fruit, illustrating different methods of packing and handling. Cable advices were sent to Honolulu embodying some of the more important results, in order that advantage might be taken of the experiments of the first shipment in preparing and forwarding the second. The second shipment arrived in San Francisco, August 21st.

Owing to very unfavorable conditions of weather at the time of gathering the fruit and packing at the plantations at Waiahawa, a considerable portion of the fruit did not arrive in condition to warrant trans-shipment. The pineapples were opened, sorted, and repacked, the riper specimens being left in San Francisco for sale. The fruit which had been picked and dried before packing arrived in San Francisco in most excellent condition, so that nearly all of it could be shipped East. The portion that was suitable for shipment, together with the avocados was placed in a refrigerated car on the 22nd and started on their journey to Sacramento, where the car joined a fruit express and proceeded to Chicago, arriving late in the afternoon of August 31st. September 1st being Sunday, and the 2nd Labor Day, it was not possible to handle the fruit of the car until Tuesday, the 3rd.

On September 3rd a large committee appointed by the Chicago Association of Commerce, visited the car and manifested much

interest in the condition of the fruit, and in its size and quality. The avocados attracted much attention as a curiosity, many of those visiting the car being unfamiliar with them. The avocados arrived in first-class condition for immediate consumption, while the pineapples were in so excellent a state of preservation that experienced fruit men in Chicago declared that they could be trans-shipped to Liverpool or to any of the great markets.

Though not the primary object of the Experiment Station, the wide advertising which was given Hawaii in general, and Hawaiian fruits in particular, incidental to these shipping experiments, means much to Hawaiian fruit industries. In this phase of the experiments, as well as in the examining of the fruit in Chicago, very great assistance was rendered by the Chicago Association of Commerce. On Wednesday, September the 4th, the Executive Committee of the Association held a luncheon at the Great Northern Hotel, which was known as the Hawaiian luncheon. On this occasion our pineapples and avocados were served and received high praise. I cannot say too much of the enthusiastic interest manifested by every member of the Association whom I met. A more broad-minded and genuine lot of business men I have not met anywhere. In the development of a market for our fruits in Chicago, I can assure the growers and shippers that the business community of Chicago will render every assistance possible.

The extent of the market for pineapples in the future will depend wholly upon the development which is made by the shippers and upon the condition and quality of the fruit on arrival. The experiments lead me to believe that with proper shipping facilities to place the fruit in San Francisco, and with proper agencies there to handle and trans-ship, our pineapples and avocados can be placed in every large market in America. Between San Francisco and points west of Ogden it will probably be necessary at first to ship mixed cars in conjunction with other shippers from San Francisco or Sacramento. At Ogden at least one firm was willing to buy pineapples by the carload. Salt Lake City, which is a larger market, could unquestionably take carload lots. In Denver many wholesale fruit houses were anxious to buy fruit by the carload. Though I was not able to visit Kansas City, Omaha, or any of the other large cities of the western country not mentioned, I have no doubt that the same condition of markets exists there as in Ogden, Salt Lake City and Denver. As an

illustration of the amount of fruit which is consumed in the city of Chicago and shipped from that center to outlying points, I may say that on one day during my short stay in Chicago 23 car-loads of California grapes were sold at public auction. The people must be taught to eat any fruit before there will be unlimited markets for it. This has been demonstrated over and over again in the case of bananas, pomelos, and many other fruits.

One of the first difficulties which I found confronting the Hawaiian fruit shippers was the high freight rate. This matter was taken up with the freight department of the Southern Pacific railroad and a rate was secured on tropical fruits the same as prevails in the case of deciduous fruits. The Southern Pacific Company took up the problem with the Inter-State Commerce Commission, asking for the privilege of advertising a rate on tropical fruits. The rate sheet now reads, "Deciduous and Tropical Fruits." The freight rate to Chicago is \$1.15 per hundred weight. To this must be added \$85 for icing charges from San Francisco to Chicago. This opens the way for commercial shipments to all points East.

The Bureau of Agriculture of the Philippines is importing sisal plants from Hawaii with a view to establishing the industry there. This is remarkable in view of the fact that the Philippines are already the center of the production of Manila hemp.

H. Rosenberg, N. Yamakami, H. T. Moore, C. J. McCarthy and C. G. Bartlett have organized a corporation to engage in the manufacture of soy sauce and vinegar.

The Waialua Agricultural Co. has applied for the purchase of about 400 acres of remnants of land in the Kaukonahua gulch.

In the Chicago Post of September 3, Secretary Straus in giving his impressions of Hawaii says: "Well-to-do American laborers, I think, would find it to their advantage to go there, as the Territorial government is desirous of giving them every facility to establish themselves, especially those who follow agricultural pursuits."

BOARD OF AGRICULTURE AND FORESTRY.

DIVISION OF ENTOMOLOGY:

INSECTS AFFECTING RUBBER PLANTS.*

BY JACOB KOTINSKY.

Our knowledge of the subject is far from complete and, aside of the few insects known to attack rubber trees on these islands, must depend upon notes compiled from other sources. The Government Entomologist of Ceylon, Mr. E. E. Green, has published in the Tropical Agriculturist, among others, a large number of notes on the insects affecting these plants in Ceylon and to these notes we are largely indebted for what we were able to gather. As we are still obliged to import numerous seed's and stumps from other countries it was deemed advisable to group the insects according to the country from which they were reported. It is gratifying indeed to know that so far we have managed to steer clear of the specific rubber tree insect pests reported from other countries. Those we have here are common thruout the Territory, affecting a large variety of plants and seldom injurious, because of the parasites and predators introduced by Mr. Koebele to keep them in check.

HAWAII.

The insects affecting rubber trees on these islands thus far brought to our attention are the following:

1. The Black Lecanium (*Saissetia nigra*) was collected on Ceara (*Manihot glaziovii*) in Honolulu (Webster); also in Nahiku (Anderson).

This scale is very common on a large number of plants in the Territory. It has been observed occasionally in rather large numbers on Hibiscus, but invariably accompanied by its enemies, which are at least three species in number, viz: *Tomocera californica*, an egg parasite; a minute internal parasite, name unknown; the larvae and adult of the Australian black ladybird (*Rhisobius ventralis*).

*Read before Rubber Growers' Convention at Nahiku, Maui, Oct. 12, 1907.

2. The "Spotted mealy bug" (*Pseudococcus virgatus*) on leaves of Ceara, was twice received from the windward side of Oahu thickly infested with this mealy bug. In both instances the bugs were accompanied by their natural enemies, which are well known to keep them in check. These comprised the black ladybird above referred to, the "Brownie" ladybird (*Cryptolaemus montrouzieri*) and at least one internal parasite. This latter is a comparatively large, black, four-winged fly usually abundant in the presence of the scale and a powerful aid in keeping it in check.

3. Red spider or mite. The identity of this animal (being a mite it is more closely related to spiders which are not insects in the true sense of the word) has not been ascertained, but it belongs to a species very widely distributed both as to territory and plant host on these islands. It has been observed on leaves of Ceara in Honolulu. I imagine it might prove serious on young plants in which case a sulphur wash applied to the under sides of the leaves will keep it in check.

4. An undetermined species af aphis or plant lice has been observed by Mr. Austin and others on the Maui rubber plantations. These plant lice seem to gather about the mid rib and leading veins on the under side of the leaf. Their punctures cause an exudation of the latex which, after drying, assumes a marked resemblance to scale bugs. There are a number of useful insects that keep all sorts of aphis on these islands in subjection, but if immediate relief becomes necessary it will be found in an application of a soap solution of one pound of soap to four gallons of water. Any soap will answer the purpose and, if the leaves are delicate, ivory or castile soap, because of their neutrality, will be found best.

5. No specimens were sent, but reports were current that "worms" are wont to attack seeds in the bed. So far as investigated those seeds suffered for having been filed too deeply.

6. What seemed to be related to a group of destructive mites (Rhyzoglyphidae) was found in numbers upon seeds imported from Mexico in course of inspection. The seeds were promptly fumigated and planted in beds at the Government Nursery where they remained under observation until it was certain the plants were free of them.

NOTE.—This completes the insects of rubber so far observed on these islands.

MEXICO AND CENTRAL AMERICA.

1. Mr. Robert Newstead, of the Liverpool University, reports the following: A scale bug (*Aspidiotus cydoniae*, Comst.) on Castilloa from Nicaragua.

This scale bug is quite common in this Territory on guava and other plants, but thus far not reported on rubber. It is also well kept in check by parasites.

2. A long-horned beetle (*Taeniotes scalaris*, Fab., var. *suturalis*, Thoms.), a borer on Castilloa from Nicaragua was reported by the same author.

3. A scale bug closely allied to our black scale above (*Platysaissetia castilloae*) was collected on Castilloa in Mexico by Prof. C. H. T. Townsend.

4. The Manihot scale (*Lecaniodiaspis manihotis*) was collected by the same person on "Nettle tree" (presumed to be a species of Manihot) in Mexico.

SINGAPORE AND INDIA.

Upon material recently examined, which was kindly submitted to me for study by the Sugar Planters' Station, and collected by Mr. Muir in Singapore, and labeled "rubber," two species of armored scale bugs were identified.

1. *Aspidiotus palmae*, Morg. & Ckll.

The species has not hitherto been reported from rubber, but it seems to be very common in the vicinity of Singapore as it was collected there by Mr. Muir on a variety of plants.

2. *Chionaspis dilatata*, Green.

This is one of the Snow scales and only a few specimens were found on the material studied.

3. A termite or white ant to be referred to under Ceylon is reported very destructive to rubber trees in India.

CEYLON.

The largest number of insects known to attack rubber is to be found in Ceylon. This fact does not necessarily indicate that Singalese rubber trees are most affected. Our knowledge of Singalese rubber insects may be more extensive merely because they were studied by a competent entomologist.

Scale Bugs. (1). The Greedy scale (*Aspidiotus camelliae*) was collected in numbers on a Castilloa plant suffering from root fungus. This scale bug is quite common in this Territory and occasionally very numerous in the mountains on Ohia and Koa, but not reported on rubber thus far. But in view of the presence of what are quite effective enemies it need not be feared.

2. A species of Lepidosaphes (a scale allied to our purple scale so common on citrus plants) was collected on Para (*Hevea brasiliensis*).

3. Grasshoppers were observed nibbling off young plants in the nursery. The occasional abundance of grasshoppers in this Territory might result in damage to young plants in our nurseries also if they are not protected. We have, however, a number of parasites that keep these animals subdued and, if necessary, we can readily check their work by means of a poison.

4. A species of long-horned beetles (*Moechotypa verrucicollos*, Gahan) was bred from stumps of Para rubber. This group of insects is usually found to attack plants after their vitality has been previously weakened in some way. In this instance Mr. Green, who records the fact, has found that the plants were suffering from a root and collar fungus (*Botryodiplodia elasticae*, Petch.).

5. Another beetle of this group (*Pterolophia annulata*, Chevr.) was bred from young Ceara trees. It was also reported from India where it actually ringbarks the trees. Mr. Green thinks that it may prove serious, but from the habits of this group as indicated above it would be well to look into the health of the tree previous to its being ringbarked.

6. A number of bees and wasps were found to build their nests in cavities of living rubber stumps or the pith of dead twigs. It is quite possible that one of these bees or wasps finding a cavity not wholly to its satisfaction will gouge out some of the substance to increase it. This, of course, means a wound, the escape of latex, an opening for the entrance of disease. It is well, therefore, to plug with earth all cavities and to trim away dead twigs. In trimming it is wisest to cut at the node else the cut surface will die down to the node next below, with all attendant ills.

7. The grubs of a cockchafer, (a beetle) were found to feed on the roots of Hevea and particularly troublesome to young

rubber trees and to remedy the evil Mr. Green recommends an application of Kainit or Saltpeter, either of which is death to the insect and vigor to the tree. It is unlikely that our Japanese beetle, the grubs of which live in the ground, will attack young rubber trees for the reason that the ground is usually wet in rubber forests, a condition favorable for the fungus that kills this beetle.

8. Termites or white ants were found to invade rubber trees and found to do considerable damage. They usually make their entrance into hollows which it is advised to plug up. A somewhat alarming report was circulated about the habits of a species of white ant (*Termes gestori*, Wasm.) in India to feed on the latex of Para. It is found at the roots of trees where its nests are located. Mr. Green believes that there must be an error about this rubber-eating habit. There is no doubt, however, that some species of white ant will attack rubber trees as well as others and it is well to be on guard.

9. The fungus disease referred to above seems to be the most serious enemy of rubber plantations in Ceylon. I believe Dr. Cobb has reported to some of the rubber plantation managers on Maui upon diseases found on their plants and recommended remedies.

I am certain that we are still free from serious insect pests on rubber plants and doubt whether the fungus diseases referred to are of any material consequence. The above list of insects affecting rubber in countries upon which we draw for our seeds and plants should bring us to a full realization of the importance of careful and conscientious inspection of rubber seeds and plants imported from outside the Territory. You can depend upon the thoroness of inspection of plants, etc., that come by way of Honolulu. But I presume there is always a chance for the ambitious (?) manager to import surreptitiously seeds and plants and evade our inspection laws. If these notes succeed in impressing you sufficiently with the importance of, so far as possible, keeping out possible insect pest invasion, to the extent that consignees will refuse to accept or introduce foreign rubber seeds or plants unless they are accompanied by a stamp or certificate from the Territorial Inspector indicating that they have received his attention, they will not have been presented in vain.

REPORT OF HORTICULTURAL QUARANTINE INSPECTION WORK.

To the Honorable Board of
Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—Since my last report to your honorable Board I have to record the arrival of seventy-eight steam and sailing vessels from outside the Territory, bringing eighteen thousand two hundred and fifty-three packages of fruits and vegetables and only five cases of plants, as this is not the season for importation of plants. By postal receipt we inspected fifty-five packages of seeds and plants, some of which we had to fumigate or disinfect for insects or fungi. Two hundred and seventy sacks of potatoes badly infested with potato scab (*fungi*) we returned to California.

All importations of rice have been carefully examined and found clean from rice pests until the arrival of a small package by mail that we found slightly infested with "rice weevil" (*Calandra oryzae*) and the larvae of *Tenebroides mauritanicus*. The first large importation of rice arrived on the S. S. "Mongolia" on July 23rd, consisting of six thousand seven hundred and forty sacks. As the insects found in this were alive, showing that the rice had not been fumigated in Japan as required by our laws and your regulations we had the importation removed by the steam barge "Pioneer" to the fumigating chambers on the Channel wharf where we treated it with bi-sulphide of carbon. We notified Collector Stackable of its condition and he refused the delivering thereof until we notified him that the insects were all destroyed. A delegation of the rice importers called upon us and stated that they were out of bi-sulphide of carbon in Japan and it would be impossible to again fumigate the rice in Japan during this season and that they were willing to have it fumigated here and pay all expenses. I informed them that I would bring the matter before you.

During my two weeks' vacation on Hawaii my assistants, Messrs. Kotinsky and Jordan, attended carefully to the inspection work and during that time destroyed several lots of in-

fested fruits, a lot of sugar cane cuttings from Australia infested with leaf hoppers and fungus, also some pumpkins from Japan infested with dipterous maggots.

Respectfully submitted,

ALEXANDER CRAW,
Superintendent of Entomology and Inspector.

COLLEGE OF AGRICULTURE AND MECHANIC ARTS.

APPOINTMENT OF DEAN.

Mr. J. E. Roadhouse, B. Sc., has been appointed Dean of the Faculty of the Hawaiian College of Agriculture and Mechanic Arts. The appointment of Mr. Roadhouse was made through the recommendation of Professor Hilgard of the University of California.

The new Dean is a Bachelor of Science of the University of California and a Post-graduate of Cornell University. For two years he has been Dean of the Technological Institute at San Luis Obispo, California, and afterwards held an appointment in the State Irrigation office at Berkeley, which office he is now relinquishing to take up his new work in Hawaii.

FRUIT EXPORT FROM HAWAII.

In the July number of the Journal of the Society of Art, London, is a contribution by Mr. F. J. Testa, on the transportation of fresh fruit from Hawaii to the United States. The article deals with the development of diversified industries in Hawaii and with the legislative enactments relating thereto, and is a useful and thoughtful statement of the subject.

AGRICULTURAL NOTES.

RHODES GRASS.

A correspondent to the Agricultural Gazette of New South Wales writes of the above grass that in sixteen to twenty days after sowing young plants appeared. Although not germinating as quickly as it was reported to do, it made good headway from the first, and surpassed in this respect even Paspalum dilatatum.

EGG-LAYING COMPETITION.

Considerable attention is devoted to egg-laying competitions in the Australian colonies. At a recent one promoted by the Sydney Morning Herald and the Sydney Mail a 200-egg average for every hen in the competition was almost attained. Hawkesbury College has for several years taken an active part in these competitions and from a first average of 130 eggs per fowl, the number has steadily risen until in 1906 a record of 195 eggs for every one of the 300 hens entered was attained. In the latest competition the winning pen of White Leghorns totalled 1473 eggs for the twelve months, averaging 28 ounces to the dozen. The actual eggs laid monthly, commencing with May, was as follows: 105, 129, 148, 142, 152, 142, 122, 122, 122, 111, 108, 70. A pen of White Wyandottes produced 1444, and another of White Leghorns 1412 eggs respectively, during the period of observation.

LEMON CURING.

The Agricultural Gazette of New South Wales for June, contains a valuable paper on Curing the Lemon, by W. J. Allen. It is fully descriptive of the process and is well illustrated.

RULES FOR EGG COMPETITION.

The following list of rules governing the egg-laying competition at Hawkesbury Agricultural College is of interest:

1. The competition to commence April 1 and end Sept. 30.
2. The competitors to pen their birds in March. Each pen to consist of six pullets or hens of any age, no male bird to be included.

3. All birds to be bred by competitors.
 4. All birds to be examined on arrival at the college and any suffering from disease to be rejected; in the event of a bird dying, the competitor to be allowed to replace it.
 5. All eggs to become the property of the Department of Agriculture.
 6. The competition to be decided by the greatest total number of eggs laid by each pen. Eggs under $1\frac{1}{2}$ ounces not to count.
 7. The market value of the eggs laid to be recorded and the weight of the eggs from each pen. Prizes to be given for the greatest aggregate weight.
 8. Records to be kept of the total quantities of the various foods consumed and the average cost per head.
-

THE HOUSE SPARROW.

This bird is rapidly spreading in New South Wales. While the bird is inflicting much harm it is recognized that it also does a certain amount of good. It is believed that the bird cannot be exterminated, but eventually when all the opposing hostile factors to its increase are in operation it will find its definite place in what is known as the "balance of nature." Among its enemies are included the mosquito, which causes mortality among the young birds.

THE CROSS-BREEDING OF SHEEP.

Under the above title, R. H. Gennings contributes a well illustrated article to the Agricultural Gazette of N. S. W. for May.

GUERNSEY COW RECORD.

A Guernsey cow, bred in England, and now in America, possesses the following remarkable record: At two years old she produced 9,958 pounds of milk and 533 pounds of fat for the year. At four and a half years old, she yielded 13,636 pounds of milk and 714 pounds of fat, the average being 5.24 pounds. She was lately sold for £800.

RAMIE FIBER.

The fiber of the Ramie plant is about the best, the longest and strongest known. The difficulty of extracting it from the stem

is, however, very great and consequently nearly all growers of Ramie have so far lost money on it. The opposition to be overcome by those endeavoring to introduce a new fiber renders its success almost impossible, as no manufacturer will buy unless it is better and cheaper than standard fibers and can be guaranteed regularly in large quantities. The price offered by the Ramie mills it at present much below the cost of production.

CHILI SAUCE.

The following recipe is from the Journal of the Jamaica Agricultural Society for May: Thirty ripe tomatoes, ten onions, six green peppers, two cups sugar, five tablespoonfuls salt, one pint vinegar. Peel the tomatoes and cut, chop the onions, boil for two hours.

PINEAPPLES IN JAMAICA.

Pineapple growing as an industry has not been profitable in Jamaica, although ideal conditions exist and shipping facilities are good. The cause of this failure is said to be attributable solely to the choice of a wrong variety of fruit. The Smooth Cayenne and the Rippley pines are reported as the rocks upon which the industry has been wrecked. It is now proposed to give more attention to the Red Spanish pineapple of which much is hoped.

MEAD OR HONEY BEER.

The following recipe is taken from the Queensland Agricultural Journal. Its simplicity of manufacture should commend this excellent beverage:

Take five gallons of rain water and add one quart of honey. Boil gently for one and a half hours, skimming often. Empty into an earthen vessel, and when blood warm pour into a clean cask. The bung should be fitted loosely. If kept in a warm room, fermentation will begin in from five to fifteen days. After fourteen days fermentation, draw off into another cask, leaving the dregs. In the second cask fermentation should be allowed to proceed from 10 to 14 days. When the mead is calm, so that nothing more is heard in the cask, close the bung. After thirty days draw off into bottles, cork well and pack in sand.

The ancient Germans attributed health and longevity to the use

of mead. In cases of fever it is found very beneficial, as it is delightfully cooling and refreshing and has not the injurious effect of wine or beer.

HEIGHT OF A LIGHT.

Question. I want to put up a light to show 10 miles. Can you tell me how high above sea level I should place it?

Answer. Multiply the miles by itself and also by four, and divide the product by 7.

$$\text{Thus: } 10 \times 10 \times 4 = 400$$

$$400 \div 7 = 57 \frac{1}{7}$$

The light should be $57 \frac{1}{7}$ feet above sea level or above level plain country.—*Queensland Agricultural Journal*.

CONCRETE FOR SILOS.

The use of concrete for the construction of silos is advocated by the Journal of the Department of Agriculture of Victoria. It is said to be both cooler and warmer than brick or lumber, and to be little more costly than lumber.

EGG-LAYING RECORD.

The world's egg-laying record for twelve months is held by Mr. W. Williams of Clarendon, Australia, whose six birds have laid 1494 eggs for that period. The net profit per bird represented by the above production is about \$2.25. The value of good laying hens needs no further comment.

REFORESTATION IN FRANCE.

The denudation of the French watersheds had become so serious that in 1860 the government appropriated \$15,000,000 to purchase 400,000 acres of the deforested area. For the last forty years an annual expenditure of \$600,000 has been made for reforestation, and the acquisition of an addition tract at a cost of \$20,000,000 is now projected.

VALUE OF PEANUT CROP.

The value of the peanut crop of the United States exceeds \$15,000,000 annually. It reaches about 400,000,000 pounds and nearly half a million people are engaged in its cultivation. As an improver of the soil, the peanut is said to equal any leguminous crop.

BANANAS IN FRANCE.

It is astonishing, says Mr. Consul-General Hearn (3283-152), in reporting on the trade of Havre, how popular bananas have become in France. Not so long ago the banana was a rarity; now it is to be found hanging up in every fruiterer's window. The bulk of the bananas consumed in Europe are imported from the Canary Islands by British firms. The West Indian banana does not appear to have reached the Continent in any great quantity as yet. In 1877 only 5,000 bunches of bananas were imported into France! this rose in 1901 to 50,000 bunches, and in 1904 to 250,000 bunches. Paris takes about half the quantity, and then the two chief consumers are Marseilles and Bordeaux. The wholesale price of a bunch is, on the average, 12s. 6d. The bananas are sold retail at three sous a piece, and as there are from 150 to 200 bananas on each bunch, that price brings the retail price of the bunch to from 16s. to 20s., which gives a profit of from 4s. to 8s. per bunch. The bananas sold in the South of France and Algeria, although sold under the name of Dahomey bananas, as a rule all come from the Canaries. The highest prices are obtained in the spring and autumn. Before France, encouraged by the high prices she has to pay for her bananas, takes to growing them herself in the many colonies suitable to their cultivation, it would be well, Mr. Hearn thinks, for British firms to stimulate the importation and taste for Jamaican and other West Indian bananas, which, in his opinion, are finer than the Canary fruit.—Journal of the Society of Arts, London, Sept. 20, 1907.

COLOMBIAN BANANAS.

Reporting upon the trade and commerce of Barranquilla and Catagena (Cd. 3283, 145), Mr. Consul Gillies says that, owing to an increased demand, there has been an enormous development during the last few years in banana cultivation. The banana enjoys great advantages over the other products of the country in that it is more easily cultivated, and is not burdened with the large freight expenses which makes the export of coffee and other articles grown in the interior so expensive. A good deal of land has recently been bought in the neighborhood of Santa Marta for the cultivation of the banana, and both native and foreign capital is being largely invested in the business. The United States is still the largest consumer, but there is now a

good market in Europe, and it is increasing year by year. The bananas produced in the district are contracted for by the United Fruit Company of New York, and are shipped to that port weekly by vessels of the Hamburg-American line, which are specially chartered for the purpose. From all accounts the cultivation of the banana is a most lucrative investment, and the prospects for the future, in view of an ever increasing demand, are bright.—*Journal of the Society of Arts, London, August 23, 1907.*

RECENT PUBLICATIONS.

FARMERS' BULLETINS.

Farmers' Bulletin 302.

Sea Island Cotton; Its Culture, Improvement, and Diseases. By W. A. Orton, Pathologist, Bureau of Plant Industry. Pp. 48, figs. 13.

Economic importance of the Sea Island cotton industry, geographical distribution and ideal requirements of the crop, possible extension, markets, factors governing prices, etc., with directions for the cultivation and handling of the crop and methods for treatment and prevention of diseases.

Farmers' Bulletin 303.

Corn-Harvesting Machinery. By C. J. Zintheo, Expert in Farm Mechanics, Office of Experiment Stations. Pp. 32, figs. 20.

This bulletin is a condensed summary of the report on corn-harvesting machinery published as Bulletin 173 of the Office of Experiment Stations, and contains illustrations of corn harvesters, binders, shockers, loaders, pickers, huskers, and shredders, with directions for their use.

Farmers' Bulletin 305.

Experiment Station Work, XLII, Compiled from the Publications of the Agricultural Experiment Stations. Pp. 32.

CONTENTS: Extension of rice culture—growing seed potatoes under mulch—Manure as a summer mulch in forcing houses—Renewal of old orchards—Injury by Bordeaux mixture—Gluten flours and similar foods—Laxative properties of wheat bran—Emmer as a feeding stuff—Roots for farm animals—Cabbage as stock feed—Pasturing hogs—Cull beans as a feed for hogs—Healthy poultry.

The above bulletins may be obtained free from the Secretary of Agriculture, Washington, D. C.

EFFECT OF MOISTURE ON WOOD.

The effect of water in softening organic tissue, as in wetting a piece of paper or a sponge, is well known, and so is the stiffening effect of drying. The same law applies to wood. By different methods of seasoning two pieces of the same stick may be given very different degrees of strength.

Wood in its green state contains moisture in the pores of the cells, like honey in a comb, and also in the substance of the cell walls. As seasoning begins, the moisture in the pores is first evaporated. This lessens the weight of the wood, but does not affect its strength. It is not until the moisture in the substance of the cell walls is drawn upon that the strength of the wood begins to increase. Scientifically, this point is known as the "fiber-saturation point." From this condition to that of absolute dryness the gain in the strength of wood is somewhat remarkable. In the case of spruce the strength is multiplied four times; indeed, spruce, in small sizes, thoroughly dried in an oven, is as strong, weight for weight, as steel. Even after the reabsorption of moisture, when the wood is again exposed to the air the strength of the sticks is still from 50 to 150 per cent. greater than when it was green. When, in drying, the fiber-saturation point is passed, the strength of wood increases as drying progresses, in accordance with a definite law, and this law can be used to calculate from the strength of a stick at one degree of moisture what its strength will be at any other degree.

Manufacturers, engineers, and builders need to know not only the strength but the weakness of the material they use, and for this reason they are quite as much interested in knowing how timbers are affected by moisture as they are in knowing how they are weakened by knots, checks, cross-grain, and other defects. It is obvious that where timbers are certain to be weakened by excessive moisture they will have to be used in larger sizes, for safety. So far, engineers of timber tests, while showing that small pieces gained greatly in strength, do not advise counting on the same results in the seasoning of large timbers, owing to the fact that the large timbers usually found in the market have defects which are sure to counterbalance the gain from seasoning.

The Forest Service has just issued a publication entitled "The Strength of Wood as Influenced by Moisture," in which are shown the strength of representative woods in all the degrees of moisture from the green state to absolute dryness, and the effects of re-soaking. This publication will be sent free upon application to the Forest Service, U. S. Department of Agriculture, Washington, D. C.

THE INTRODUCTION OF TOP MINNOWS INTO THE HAWAIIAN ISLANDS.

This publication comprises Press Bulletin No. 20 of the Hawaii Agricultural Station, and is written by D. L. Van Dine, Entomologist of the Station. It gives concisely an account of the successful introduction to Hawaii of the Top Minnows, the natural enemies of the mosquitoes and of their establishment in our waters.

MARKETING HAWAIIAN FRUITS.

Under the above title Mr. J. E. Higgins, Horticulturist of the Hawaii Agricultural Experiment Station, contributes Bulletin No. 14 to the publication of the local station.

For many years heavy losses have been entailed by shipping fruits to the mainland. These losses have so greatly increased of late that there has been a general tendency to can the greater part of the crop and some companies have entirely abandoned shipping fresh fruits to the coast.

An experiment was undertaken by the station in shipping Hawaiian fruits packed in different methods, treated in various ways, and subjected to the same conditions as other fruits in transit. In the above bulletin Mr. Higgins enters into a clear and exhaustive account of the results achieved by this initial experiment, by reference to which the Hawaiian grower may determine the way in which to market his product with most advantage.

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NOTICE FROM THE DIVISION OF ENTOMOLOGY

The Entomological Division of this Board wishes to inform Hawaiian readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER & AGRICULTURIST

VOL. IV

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REPORT OF COMMITTEE ON FORESTRY.

The following is the report in full of the Committee on Forestry, presented by Mr. Thurston at the annual meeting of the Hawaiian Sugar Planters' Association:

The year 1907 has been one of progress and development in connection with forestry in Hawaii.

The forest reserve policy of the government has been steadily pursued, several important reserves having been added to those already existing. A detailed statement concerning what has been done in this respect will be submitted to the Association by Mr. Ralph S. Hosmer, the superintendent of forestry.

The year has been marked by a considerable increase in the number of persons who have taken advantage of the offer of the Board of Forestry to furnish free professional advice as to location of forest planting, kinds of trees best adapted to given localities and assistance in ways and means of establishing local nurseries and planting out trees. This interest has been especially manifested by plantation and ranch managers.

FOUR EVENTS IN FORESTRY DEVELOPMENT.

Four distinct matters relating to forestry have come to the front during this year, which are deserving of the attention of this Association. These are as follows:

First, a compilation and publication by the Federal forest authorities of statistics showing that the lumber forests of the United States, will, at only the present rate of consumption, last only about thirty years more, and that the hard wood supply of the United States is already practically exhausted, with a hard-wood famine, not only in prospect, but actually at hand.

Second, a definite formulation by the Superintendent of Forestry of Hawaii, in a report concerning a proposition to lumber the woods back of Hilo, Hawaii, of a policy concerning lumbering forests which are primarily needed as protec-

tion to water-shed as distinguished from a forest on an area from which there is no normal water flow; and the adoption of the policy so formulated by the Board of Agriculture and its approval by the Governor.

Third, the negotiation by the Hawaiian Mahogany Lumber Company, an Hawaiian corporation, of a contract with the Atchison, Topeka & Santa Fé Railroad Company, under which the former has undertaken to deliver to the latter something over 500,000 Ohia railroad ties per annum for the next five years.

Fourth, the demonstration, on a large scale, that Rubber grows well in Hawaii and can be made a profitable industry here; with the incidental effect that a large area will be planted up in rubber trees, which, from a forest protection of the land standpoint, are as good as any other variety of trees.

All of these four matters are of vital interest, not only to the citizens of the Territory of Hawaii at large, but especially to the sugar planters, as I will seek to hereinafter show.

Taking up the above subjects in the order named:

PINCHOT ON FOREST FAILURE

FIRST. THE LUMBER SHORTAGE AND HARDWOOD FAMINE IN THE UNITED STATES.

Gifford Pinchot, chief of the United States Forest Service, in an article published in *The Outlook* for October 12, 1907, makes the following statement:

After enumerating the statistics showing the amount of standing timber now in the United States; the present annual consumption and the present annual growth, he states:

* * * "The result shows a probable duration of our supplies of timber of not more than thirty-three years.

"Estimates of this kind are almost inevitably misleading. For example, it is certain that the rate of consumption of timber will increase enormously in the future, as it has in the past, so long as supplies remain to draw upon. Exact knowledge of many other factors is needed before closely accurate results can be obtained. The figures cited are, however, sufficiently reliable to make it certain that the United States has already crossed the verge of a timber famine so severe that its blighting effects will be felt in every household in the land."

"The rise in the price of lumber which marked the opening of the present century is the beginning of a vastly greater and more rapid rise which is to come.

"We must necessarily begin to suffer from the scarcity of timber long before our supplies are completely exhausted.

"It is well to remember that there is no foreign source from

which we can draw cheap and abundant supplies of timber to meet a demand per capita so large as to be without parallel in the world, and that the suffering which will result from the progressive failure of our timber was but faintly foreshadowed by the recent temporary scarcity of coal.

WHEN THE FORESTS FAIL.

"What will happen when the forests fail?

"In the first place, the business of lumbering will disappear. It is now the fourth greatest industry in the United States.

"All forms of building industries will suffer with it, and the occupants of houses, offices, and stores must pay the added cost.

"Mining will become vastly more expensive; and with the rise in the cost of mining there must follow a corresponding rise in the price of coal, iron, and other minerals.

"The railways, which have, as yet, failed entirely to develop a satisfactory substitute for the wooden tie (and must, in the opinion of their best engineers, continue to fail), will be profoundly affected, and the cost of transportation will suffer a corresponding increase.

"Water power for lighting, manufacturing and transportation, and the movement of freight and passengers by inland waterways, will be affected still more directly than the steam railways.

"The cultivation of the soil, with or without irrigation, will be hampered by the increased cost of agricultural tools, fencing, and the wood needed for other purposes about a farm. Irrigated agriculture will suffer most of all for the destruction of the forests means the loss of the waters as surely as night follows day.

"With the rise in the cost of producing food, the cost of food itself will rise. Commerce in general will necessarily be affected by the difficulties of the primary industries upon which it depends.

A SUICIDAL POLICY.

"In a word, when the forests fail, the daily life of the average citizen will inevitably feel the pinch on every side. And the forests have already begun to fail, as the direct result of the suicidal policy of forest destruction which the people of the United States have allowed themselves to pursue. * * *

"We are accustomed, and rightly accustomed, to take pride in the vigorous and healthful growth of the United States, and in its vast promise for the future. Yet we are making no preparation to realize what we so easily and glibly foresee

and predict. The vast possibilities of our great future will become realities only if we make ourselves, in a sense, responsible for that future.

"The planned and orderly development and conservation of our natural resources is the first duty of the United States."

MORE EXPERT EVIDENCE.

In a report on the timber supply of the United States, made by R. S. Kellogg of the Federal Forest Service in April, 1897, he makes the following statements:

"The lavish manner in which the United States has consumed the products of its forests and the rapidity with which our timber supply is melting away are wholly unappreciated by those who have never given the matter more than passing consideration. * * *

"Rapidly as the population of the United States has increased the lumber consumption has increased still more rapidly. In round numbers, the lumber cut in 1880 was 18 billion feet; in 1890, 24 billion feet, and in 1900, 35 billion feet. The increase in population from 1880 to 1900 was 52% but in lumber cut 94%.

"The original stand of white pine in the Northeast, is almost entirely cut out. The present stand in the Northeastern States is mainly spruce, second-growth white pine and hemlock.
* * *

"It is well known that the days of white pine are rapidly passing and * * * it will in a few years cease to be a large factor in the timber supply of the United States.

SAW MILLS GO OUT OF BUSINESS.

"At the last annual meeting of the Northern Pine Manufacturers' Association in Minneapolis, Minnesota, the secretary presented the following statement:

"Since 1895, 248 firms, representing an annual output of pine lumber of $4\frac{1}{4}$ billion feet, have retired from business, due to the exhaustion of their timber supply. Plants representing approximately 500 million feet capacity which sawed in 1906 will not be operated in 1907."

"The amount of hardwood stumpage is rapidly decreasing. The hardwood cut in 1900 was 8 billion feet, in 1904, 6 billion feet, and the present annual cut of hardwoods is about 5 billion feet.

"As an instance of the timber shortage in the East it is stated that in New England 6 inches is now a common cutting diameter for white pine, while formerly, and where lumbering is intelligently done, 18 inches is the minimum limit.

"We are rapidly using up our forest capital. Our present annual consumption of wood in all forms is from three to four times as great as the annual increment of our forests. * * * Every indication points to the fact that under present conditions the maximum annual yield of forest products for the country as a whole has been reached, and that in a comparatively short time there will be a marked decrease in the total output, as there is now in several items. Neither is there any great supply of timber to turn to outside of the United States. With the exception of importations of small quantities of high-class woods like mahogany, the only promising source is Canada; but most of the timber there will be required at home. Even now Douglas fir (Northwest) is bringing higher prices in Canada than in American markets."

DR. FERNOW ON THE LUMBER SHORTAGE.

In February, 1907, Dr. B. E. Fernow, one of the leading forestry authorities in the United States, made the following statement in an article published in *Forestry and Irrigation* for February, 1907:

"One hundred and fifty years ago Germany found herself in very much the same condition as regards her forest resources as we are today in the United States—all accessible portions more or less culled, or in poor coppice, burnt over, and damaged by cattle, the valuable virgin timber mostly confined to distant and inaccessible locations. Sporadic attempts existed here and there at protection, at regulation of the cut, at conservative lumbering, and still more sporadic attempts at reforestation. * * * Yet until the beginning of the nineteenth century reduction of supplies without adequate reproduction proceeded, and around the year 1800 the wood famine had become acute, giving rise to the same kind of agitation and literature which we have experienced, even to bringing in the catalpa, and other such small rapid growers as the saviors of the nation."

PROFITABLE FORESTRY IN EUROPE.

"The severity of the timber shortage in Germany at that time was temporarily relieved through increased production of coal and the building of railroads in hitherto inaccessible forest regions. Then came the vigorous organization of a settled policy of forest management, based upon the principle of sustained yield, or the cutting of the increment only, without lessening the wood capital. The results of this policy were that in Saxony the cut increased between the years 1820 and 1890 just 50%, and up to 1904 has increased by another 5%.

"In Prussia, in 1830, the cut was 20 cubic feet per acre, and in 1865 increased to only 24 cubic feet. In 1890 it was 52, and in 1904 it had grown to 65 cubic feet. Forest management increased the average acre production in 75 years more than threefold.

"Every acre of forest in Germany—State, Municipal and private; good, bad and indifferent, productive and unproductive, now yields an average net profit of \$2.40 per acre annually, representing 5% on a valuation of \$50 per acre, and this is constantly improving.

"It must not be overlooked that these results have come largely from non-agricultural lands, the sandy plains, the swamps, the rough mountain slopes, and from forests which were mismanaged like ours.

"Can we expect to attain the same or similar results?

"We ought to do much better, for we have the hundred years of experience of our friends across the water to draw on and we can avoid many of the mistakes which they have naturally made and paid for."

HALL ON THE HARDWOOD FAMINE.

In the report by William L. Hall, assistant forester of the United States, on "The Waning Hardwood Supply of the United States * * *" dated September 24, 1907, and which has just arrived in Honolulu, he makes the statement that the cut of hardwood lumber in the United States decreased 15 per cent. between 1899 and 1906.

"This decrease took place during a period when American industries sprang forward at a pace unparalleled; when there was the strongest demand ever known for every class of structural material; when the output of pig iron increased 15 per cent., that of cement 132 per cent. and even that of soft-wood timber 15 per cent.

"That the decrease is due to diminished supply rather than to lessened demand seems to be proved beyond question. During the same period the wholesale price of various classes of hardwood lumber advanced from 25 to 65 per cent.; every kind of hardwood found in quantity sufficient to make it useful has been put on the market, and hardwood timber is now being cut in every State and every locality where it exists in quantity large enough to be cut with profit. These conditions could not prevail were the decrease in production due to a falling off in demand.

DECREASE OF HARDWOOD SUPPLY.

"Since 1899 the production of oak has decreased 36 per cent.; of yellow poplar, 37 per cent.; of elm, 50 per cent.; of cottonwood, 36 per cent. and of ash 20 per cent."

It is stated that the shortage is being made up by resorting to the inferior hardwoods, and, "although almost all possible new woods have been brought into use there has still been a shrinkage in the total output of 15 per cent.

"The supply in Indiana and Ohio, the original center of hardwood production, is practically exhausted. * * * In all of the States West of the Mississippi Valley the supply is small and can never become much of a factor. The impressive thing is that we are bringing hardwoods from far and near, and still the cut is going down.

"The southern part of Michigan, which originally bore magnificent hardwoods, was the first part of the State to be cleared. * * * The same is true of Wisconsin and Minnesota. The almost complete exhaustion of their timber supply, and the transformation of their hardwood lands into farms are apparently the only results to be expected. * * * In the Appalachian, as in the other regions, the hardwood lumbermen are working upon the remnants. The supply is getting short and the end is coming into sight."

ONLY SIXTEEN YEARS' SUPPLY LEFT.

Mr. Hall estimates that from the statistics of present supply of hardwood and present annual use of the same there exist in the United States today only sixteen years' supply.

He says that since 1898 the price of hard maple per thousand feet board measure has increased from \$20 to \$32.50 per thousand; of yellow poplar, from \$30 to \$53.50 per thousand; of hickory, from \$45 to \$65 per thousand, and of quartered white oak, from \$60 to \$80 per thousand.

Accompanying this increase in price has been a lowering of the standard.

Prior to 1907 the rules of the trade required even lengths, with a minimum length of 6 feet. In 1907 the Hardwood Lumber Association reduced the minimum to lengths of 4 feet and allowed odd lengths.

"IT EMPHASIZES THE FACT THAT WE ARE DOWN TO THE ROCK BOTTOM AND REQUIRE EVERY SOUND PIECE OF HARDWOOD LUMBER THAT CAN BE PUT UPON THE MARKET."

Between 1899 and 1906 the number of employes in the hardwood industry in Ohio decreased 40 per cent. and in Indiana 42 per cent.

An enumeration is given of the businesses directly depending upon hardwood, viz: Lumber, cooperage, furniture, vehicles, musical instruments, small wooden-ware, agricultural implements, cars, boxes and crates, railroad ties, telephone and telegraph poles and house finishing.

Mr. Hall concludes:

"The exhaustion of the hardwood supply means the loss of these industries to the States in which they are located. * * * How intensely the whole country would feel the loss of its hardwood timber * * * can scarcely be realized. * * * A general failure in crops may affect industrial conditions for a few years—a failure in the hardwood supply would be a blight upon our industries through more than a generation.

THE SITUATION IN BRIEF.

"The situation in brief is this: We have about a fifteen years' supply of hardwood lumber now ready to cut. * * * The inevitable conclusion is that there are lean years close ahead in the use of hardwood timber. There is to be a gap in the supply which exists and the supply which will have to be provided. How large that gap will be, depends upon how soon and how effectively we begin to make provision for the future supply. The present indications are that in spite of the best we can do there will be a shortage of hardwoods running through at least fifteen years. How acute that shortage may become and how serious a check it will put upon the industries concerned cannot now be foretold. That it will strike at the very foundation of some of the country's most important industries is unquestionable. This much is true beyond doubt, that we are dangerously near a hardwood famine and have made no provision against it."

After designating possible substitutes for hardwoods, such as metal, concrete and softwoods; Mr. Hall says:

THE ONLY PRACTICABLE SOLUTION.

"There seems to be but one practicable solution, and that is to maintain permanently, under a proper system of forestry, a sufficient area of hardwood land to produce by growth a large proportion of the hardwood timber which the nation requires. * * * The longer the delay in putting the forest under control, the longer continued and more extreme will be the shortage."

The foregoing statements are those of professional salaried experts, with nothing to gain by exaggeration, and are based upon statistics made with all the exhaustive resources of the United States Treasury.

These statistics are brought right up to the year 1907, and bring home to us, as nothing that I have yet seen does, the fact that not only forest protection but forest reproduction is of vital import to the sugar industry, as well as every other industry in Hawaii.

We have for years been unthinkingly cutting off our forests for firewood; devastating them with cattle; carelessly allowing their destruction by wild goats, and paying practically no attention to reforesting; while we have imported not only all kinds of both soft and hardwood, both manufactured and unmanufactured, for general domestic use, but have also been importing even our railroad ties, telephone poles and fence posts.

Within the year we have been brought up against the fact that not only have prices gone ballooning, but that even railroad ties and fence posts are hard to obtain even at the advanced prices. If prices of lumber in general, and hardwood in particular, are going to be prohibitory in the United States, where the material is produced, they are going to be more so here, where the added freight must be reckoned with.

THE REMEDY IN HAWAII.

What is the remedy?

There is and can be only one remedy. It is the same here that it is in the United States, and the same there that it was in Europe when they faced the same condition a hundred years ago.

The remedy is to stop unnecessary destruction of forests and immediately begin reforestation, both by protection of semi-forested areas, so that partly destroyed forests will return by natural means; and by replanting.

This should be done both through the medium of private effort and public appropriation.

It lies within the power of every sugar plantation and every cattle ranch in the Territory to, within the year, at an expense so small that it bears no comparison to the benefits to be derived, shut out cattle from every portion of the land which ought to be in forest, and, if no more is done, to plant along roadways, around house-lots, in gulches, waste land and on steep hill sides unsuitable for agriculture, trees enough to, within the next ten years, supply a very large proportion, if not the whole of the fence posts, railroad ties, telephone poles and firewood needed for consumption in the Territory.

RAPID GROWING HARDWOODS.

The few years during which there has been a skeleton of a forestry department maintained by the government in Hawaii has demonstrated that we have available a highly valuable assortment of rapid growing hardwood trees, such as a number of the varieties of the eucalypti, the iron woods, the silver oak and some of the acacias, besides that most valuable lumber tree, the Japanese pine.

We do not need any statistics or foreign expert advice upon this subject. The forestry experiments which have been carried on by the government on the ridges back of Honolulu; by the Lihue Plantation and George Wilcox on Kauai; by the Baldwin plantations; the Haleakala Ranch and by Captain Makee at Ulupalakua on the island of Maui, and by the Pacific Sugar Company on Hawaii, have already demonstrated what these trees will do.

RESULTS ON HALEAKALA RANCH.

As to what can be accomplished by continuous effort at small expense, I speak only as to my own knowledge in connection with the Haleakala Ranch on Maui, where, within the past seven years, at an expense of less than \$500 a year, there have been planted out and are now growing well about 60,000 trees, which are already beginning to yield timber for fencing and all necessary ranching purposes.

During the past summer on this ranch there were cut from thirty-three second-growth rastrada eucalyptus trees 230 good fence posts.

There is no reason why equally good results cannot be obtained almost anywhere on the islands.

Private work on forests is within the immediate control of individuals and corporations, but public work of this kind requires legislative appropriation.

REFORESTING APPROPRIATIONS NEEDED.

Up to the present time the Hawaiian Legislature has contented itself with appropriations for forest purposes barely sufficient to maintain a skeleton organization, without sufficient funds to take up the active work of reforesting.

To obtain appropriations for this purpose requires a public enlightenment and support from that portion of the community which recognizes the necessity of the situation.

There is no organization in the Territory which compares with the Planters' Association in power to bring to bear upon the legislature intelligent public opinion and influence.

I submit that not only should the Association pass resolutions to be presented to the legislature, in support of appropriations for reforesting, but that in their own interests, individual members should use their private influence in support of such a policy.

MEN AND METHODS ARE AVAILABLE.

The methods of propagation of tree seeds and of the young trees has been studied out and we are supplied with men who know just how it is to be done.

One of the ablest of these, Mr. Hawes, of the local Government Forestry Service, an educated forester, has spent the last twenty years of his life in studying the subject and his services are now available free to everyone, private, individual or corporation, who wishes the benefit of his advice on the ground as to what to do and how to do it.

All that is lacking is the desire to act and the carrying of the desire into effect.

SECOND. THE LUMBERING POLICY OF THE TERRITORY ON WATERSHED AS DISTINGUISHED FROM NON-WATERSHED FOREST AREAS.

The government owns a large area of forest land back of the Hilo District.

This forest contains large quantities of both Ohia and Koa timber.

This forest also is located upon one of the principal watersheds of the Territory, the entire town and District of Hilo obtaining their water supply from this source.

Early this year an application was made to the government for permission to cut timber from this forest.

The fact that, with the approval of the Superintendent and Board of Forestry, lumbering on a considerable scale in the Kau and Kona Districts of Hawaii had recently been approved, gave much concern to those interested in the Hilo water supply, for fear that consistency might require a like approval of lumbering in the Hilo District.

The Territorial Superintendent of Forestry, Mr. Hosmer, made an exhaustive study of the situation, and a report thereon to the Board of Forestry, recommending that the request be denied. The Board of Forestry adopted the reasoning and the recommendation of the report, and the Land Commissioner and Governor of the Territory have approved of the recommendation of the Board.

FOUNDATION PRINCIPLES INVOLVED.

I consider that the principles involved in the differentiation between the Hilo forest on the one hand, and the Kau and Kona forests on the other, lie at the foundation of the forestry question in this Territory, and, that if the policy as outlined in connection with this particular case can be established as the continuing policy of the Territory, it will far more than justify all the expense which the Forestry Department of the Government has heretofore caused, and be added cause for congratulation that the Territory has been so fortunate as to secure at the head of its Forestry Department an educated forester, representing the most advanced study and intelligence concerning the subject available in the United States.

Although the Forestry Department in Hawaii has not, as yet, much to show in the way of material returns, it is of immense advantage to the people of this Territory to have the principles upon which they should proceed, intelligently studied out on the ground and clearly expressed, so that the lay man may understand why it is good economy to lumber one section of the island forests and not to do so in another.

THE FACTS INVOLVED.

Mr. Hosmer's report brings out the line of demarcation between the watershed and the non-watershed territory so clearly, that all that needs to be further said in this connection is to make a few quotations from his report.

After describing the nature of the forested area, Mr. Hosmer says:

"All over the area are springs, pools and swamps that feed the various small tributaries to the Wailuku river and its several branches. Practically the whole drainage basin of this stream is on this land. * * * Very little is known accurately of the actual sources of the water in the streams or from which part of the forest they are most largely fed; but the indications are that from one-third to one-half of the water comes from the area of pure Ohia forest, while the remainder is the result of springs and swamps lower down. These springs are dependent for their sustained and equalized flow on the protection afforded by the forest cover. * * *

"Having given the problem thorough and careful study, both on the ground and in its various relations, I cannot report favorably on the proposition to lumber this tract.

"My principal reasons for this decision are three in number.

PROTECTION OF WATER FLOW.

"FIRST: I BELIEVE THE GREATEST VALUE OF THE FOREST ON PIIHONUA TO BE IN THE INFLUENCE WHICH IT HAS ON THE BRANCH OF THE WAILUKU RIVER AND ITS BRANCHES, I. E., ON THE EFFECT THE FOREST EXERTS ON THE WATER AFTER IT REACHES THE SURFACE, BY EQUALIZING THE FLOW AND PREVENTING EXCESSIVE RUN OFF.

"In view of use and possible further development for water power, irrigation and even for domestic supply—especially in connection with the growth of Hilo town—I regard the Wailuku as one of, if not, the most important stream protected by a forest reserve in the Territory.

"It might be possible, if the work were done under careful restrictions, to remove some of the mature trees from the Piihonua forest without detriment to its water conserving qualities; but to make lumbering profitable the operations would have to be conducted on a large scale. This would inevitably involve the opening up of considerable areas in sections where A COMPLETE FOREST COVER IS MOST NEEDED. Such a policy on this particular watershed would be fraught with danger. It is a risk which I do not believe the Territory should take; for the money to be obtained as stumpage would in no way compensate for the injury that would result were the regular flow of the Wailuku river seriously interfered with. * * *

UTILIZATION OF TIMBER.

"Second: The forest policy of the Territory has been, and is, to create a chain of forest reserves that are essentially 'protection forests.'

"ON THE LEEWARD SIDE OF THE ISLAND, WHERE, BECAUSE OF THE ABSENCE OF RUNNING STREAMS WATERSHED PROTECTION DOES NOT FIGURE, I AM IN FAVOR OF UTILIZING THE MERCHANTABLE TIMBER. BUT ON THE WINDWARD SIDE OF HAWAII I BELIEVE THAT THE FOREST IN THE SEVERAL ESTABLISHED FOREST RESERVES, SHOULD, FOR THE MOST PART, BE KEPT INTACT, AT ANY RATE FOR THE PRESENT. * * *

"Third: My third reason is from a professional standpoint. "Forestry rests on a business as well as on a scientific basis.

"In the consideration of such a problem as the lumbering of the Piihonua forest, the factor of whether or not it would pay is an essential one.

"Even were it desirable that lumbering should be permitted, it would, in my judgment, be necessary, in order to safeguard the favorable conditions of stream flow that now exist, to load the contract with stringent regulations as to the area to be logged, the methods to be used and the subsequent treatment of the tract."

Mr. Hosmer concludes that in the instance under consideration these regulations would leave no margin of profit for the contractor, and that, therefore it would be unjustifiable to recommend foresting under conditions which could not result in profit.

THE IMPORTANT FEATURE.

THE IMPORTANT FEATURE IN THE POLICY EMPHASIZED BY THE FOREGOING REPORT IS THE RADICAL DIFFERENCE BETWEEN THE FORESTS WHICH ACT AS A REGULATOR OF THE FLOW OF WATER AND FORESTS FROM WHICH THERE IS NO WATER FLOW.

Whether forests affect climate, especially rainfall, or not, is a disputed point.

My personal belief, based on personal knowledge of a large part of this Territory, is that it does have a strong effect thereon in many parts of this Territory.

There is, however, no dispute, and can be no dispute that a thick forest cover not only helps, but is absolutely essential to the maintenance of an even flow of water from a given water producing area.

I go further and claim that a forest on a water producing area in this Territory, with its heavy rainfalls and short watersheds, is absolutely essential to any economical flow of water at all.

HAWAIIAN WATERSHEDS ARE SHORT.

The Hawaiian streams, which furnish water for irrigation and other economic use, all rise in forest areas with watersheds of from five or six to less than thirty miles in length.

It requires no scientific study or reasoning to demonstrate that water flowing upon an area of land averaging not over 12 to 15 miles in length and on a grade of from 5 to 50 per cent., will not hold water for more than a few hours after rainfall has ceased, unless there is not only a forest, but a thick jungle of ferns, moss and debris to prevent its rushing in a torrent to the sea.

The forest is not enough under such circumstances. There must be a subsidiary growth of small trees and shrubs; under that a growth of ferns and creeping vines and in addition to that an undisturbed matting of leaves, sticks and moss creating a mass of material so thick as to hamper and almost prevent the flow of water. Once a clearing is made sufficient for the water to wear a course for itself and the heavy torrential rains, with the steep grade, will cut innumerable water courses to the sea, denuding the land of soil and draining off the water supply.

The almost constant standing water and semi-swampy condition existing in Hawaiian water-producing forests is essential to the very existence of this character of forest, as the existence of this character of forest is necessary to the con-

servation of the water supply. Neither can exist without the other.

Under these circumstances, any radical interference whatsoever with any portion of the forest immediately sets in motion a train of events which eventually destroys the whole.

In other words, it is my firm conviction, based upon fairly close observation extending over the last thirty-five years, that the forest growth on the water-producing watersheds of Hawaii must be, as far as possible, absolutely closed to interference, either by man or beast, or the result will be, in spite of all effort to the contrary, a doubly reacting disintegration of the forest, and diminution and final destruction of the area as an economic water-producing source.

NON-WATER PRODUCING FORESTS.

In marked contrast to this, as brought out by Mr. Hosmer's report, is the Hawaiian forest which does not cover a water-producing area.

Here there is no water flow to complicate the question.

There is not only no water to conserve, but the natural growth of the forest, being more open, does not require the careful protection which the forest growing in a semi-swamp does. The undergrowth is hardier and recovers more easily than it does in the water-soaked section.

With proper care, the mature trees can be removed, not only without radical damage to the remaining growth, but to the advantage of the younger growth; and by opening up the under vegetation, gives opportunity for seeds to start and saplings to reach the light, which otherwise would fail to germinate or die for lack of room.

It becomes simply a question of intelligent lumbering; the making of the forest a revenue-producer through the medium of lumber instead of through the medium of water.

The principle involved in both cases is the same, viz: the causing the soil to produce that which will be the most value to mankind. In the water-producing area that which can be produced of most value is water. In the non-water producing forest that which can be produced of most value is timber.

How to intelligently lumber forests, is a question which has had expert study of a high class in most European countries and to which great attention is now being paid in the United States. There is no mystery about it. It simply consists in intelligent application of common sense to local conditions. This has been done in Europe and is being done in the United States. It has practically never yet been done in Hawaii.

WHAT FOREST RESERVES MEAN.

Popular opinion in Hawaii largely conceives of a forest reserve, as an area which is locked up and removed from profitable enterprise.

As a matter of fact, in the case of water-producing forest, it is a devoting of the land to the production of that which is of the most value to the people of the Territory, viz: water.

In the case of non-water producing forest, it means, not locking up from profitable use, but protecting the forest from destructive agencies, so that it can be made profitable, which now it is not, and, with a few exceptions, never has been; and, unless the methods of lumbering and reproduction evolved by study in Europe and the United States are applied here, never will be.

In other words, the most valuable crop which can be produced in a water bearing forest, is water. The most valuable crop which can be produced in a non-water producing forest, is timber. Whatever will most effectively accomplish these results in the respective cases, is in the public, as well as private interest, and should be done.

THE MAHOGANY LUMBER COMPANY.

(3). THIS NATURALLY BRINGS US TO THE CONSIDERATION OF THE EXTENSIVE OPERATIONS NOW BEING UNDERTAKEN, BY THE HAWAIIAN MAHOGANY LUMBER COMPANY.

The proposition that Hawaii possesses forests which can produce railroad ties by the million, has come as an intense surprise to all but a very few in Hawaii.

The fact that ties can be produced and exported at a profit has come as a surprise to everyone. The only possible explanation thereof is the practical lumber famine which is now upon the United States and so graphically described in the official reports above quoted from. This shortage has for the first time made it possible to bring home to the people of Hawaii, in cold dollars and cents, that forest production and lumbering can be made an important industry in this Territory.

The fact that nearly three million standard railroad ties are to be exported from the Territory within the next five years has produced much solicitude and adverse comment among those who have not studied the question. Within the past month I have repeatedly heard the statement made that this contract was a bad thing for the Territory as it would not only denude the forest but exhaust the entire local supply of timber.

WHERE THE TIMBER WILL COME FROM.

So far from this being the case, the fact is that almost this entire contract will be filled with timber cut from the arable lands of the Olaa and Puna Sugar Companies, which, in ordinary process, they are clearing for the cultivation of sugar cane.

Heretofore the timber cleared from similar lands has been removed at large expense and burned on the ground to get rid of it.

Under this contract the timber will be removed at no expense to the plantations and a handsome stumpage will be paid to them instead.

Just how much more Ohia there is available for lumbering cannot now be definitely stated, without much more careful examination than has heretofore been given to the subject, but it is entirely conservative to say that there is ten times as much more available Ohia as that involved in this contract without in any way interfering with water conserving forests.

Comparatively little of the Ohia forest available for lumbering is suitable for cultivation. The great bulk of it is on land so rocky or so steep, or at such elevations as to make agriculture impracticable for any products now known to be profitable.

In consequence of this fact the great bulk of the Ohia forest land will continue to be forest land. Whether they will continue to produce only Ohia timber is a question which the future must determine, after intelligent study by forestry experts has been given to the subject. It may very well be that it will pay to substitute the slow growing Ohia tree, as the mature Ohia forest is removed, with the quicker growing hardwood trees which are so easily propagated here.

NO FEAR OF FOREST DESTRUCTION.

The people of Hawaii need have no fear that the present move to make valuable the heretofore waste forests of Hawaii, is a move toward denudation of the forest and the carrying on of the policy of forest destruction which has heretofore prevailed so generally.

The one railroad tie contract above referred to means that there will, within the next five years, be brought into this Territory approximately two and one-half million dollars in gold coin which, but for that contract, would never have come here.

It means that this contract will demonstrate that lumber production can be made one of our leading industries. This is with the proviso, however, that such lumbering is done under intelligent supervision and is followed up by intelligent

care of the area lumbered, looking toward the protection of the young trees remaining and the propagation of additional trees.

The outlook is full of hope in this connection, for the operations of the Mahogany Lumber Company, not only in connection with its lumbering of Ohia ties, but of the Koa forests, is being consistently carried out, both on the part of the forest owners and of the lumbering company, under the direct supervision and advice of the Superintendent of Forestry and subject to the rules and regulations of the Board of Forestry.

THE RUBBER INDUSTRY.

(4). THE RUBBER INDUSTRY AS RELATED TO FORESTRY.

Systematic rubber planting in Hawaii as an industry was begun three years ago, but until this year there have been no systematic tapping of trees and keeping of statistics of yield, on which to base commercial calculations of the profitableness or otherwise of the business.

During the past year under the direction of Jared Smith, chief of the Federal Agricultural Experiment Station in Hawaii, a number of mature rubber trees growing in the Territory have been tapped and statistics kept of the yield. The results are not yet available for publication but sufficient has been learned to make it certain that rubber production will be profitable in this Territory under existing conditions.

This fact has been accepted to the extent that there are already five incorporated companies planting rubber on a considerable scale, besides a large number of individuals planting on a small scale. There have already been planted in the Territory between five and six hundred thousand rubber trees. The first tapping on any scale will take place next summer.

FORESTRY AND THE PLANTERS' ASSOCIATION.

From the standpoint of a profitable industry there is great hope in rubber, especially as, although the trees require good soil, they can be grown to advantage in patches scattered through the many small valleys which are found in all the mountain sections of the Territory. The business will therefore not only be of value in creating a new profitable industry, but will incidentally assist in reforesting the islands, especially where, by reason of inaccessible or smallness of area, it probably would never pay to plant for lumbering purposes.

Intelligent advice should be sought as to where and when to plant rubber trees, as they will not grow well at either the

elevations or under rainfall conditions where many other trees will do finely.

There are unquestionably, however, large areas which are unfit for general cultivation, which should be reforested, and where rubber trees will do as well, and be more profitable, than any other tree which can be planted there.

The local Federal Agricultural Station has issued bulletins upon the subject of rubber culture and is about to issue another one.

The Territorial Agricultural Forestry Department has also interested itself in the matter; is furnishing rubber seed at approximately cost to all who desire it, and is prepared to give expert advice and suggestions as to locations and methods of planting.

RUBBER AS INCIDENTAL TO SUGAR.

There is no reason why, incidentally, a number of sugar plantations, especially those in the non-irrigated windward districts, should not, at slight expense, plant large numbers of rubber trees in gulches and other localities unsuitable for cane, resulting in a benefit by present reforesting; and ultimate profit from the rubber product which, if present prices prevail and the expectations of those who have made a study of rubber are fulfilled, will eventually be greater per acre than is even sugar.

The concrete results of next year's tapping of the trees at Nahiku will be watched with eager interest by all interested in the development of Hawaii.

RUBBER AS A REFORESTING AGENT.

Altogether 1907 has been a memorable year in the history of forestry and forest products in Hawaii. Whether the events of the year shall be taken to heart and made available for the beneficial progress of the Territory, either through the medium of public or private enterprise, depends largely upon the intelligence and energy of the members of this Association.

In the past the subject of forestry has been largely treated by this Association as an interesting incident, but not as one of direct concern or of possible immediate benefit or profit to its members. Within two years I have heard of trees bounding fields being cut out because the shade injured the adjoining cane.

In all earnestness I urge upon the Association that the time for this view of forestry and its possibilities in Hawaii has past, and that the preservation, propagation and utilizing of

forests and forest products should from this time forth be made one of the leading features of the efforts of the Planters' Association, both by it as an organization, and through the individuals and corporations which give it its strength.

Respectfully submitted,

LORRIN A. THURSTON,
Committee on Forestry.

NEW FRUIT MARKETS.

The following letter by Mr. Jared Smith, is copied from a recent Advertiser:

Editor Advertiser: Mr. J. E. Higgins reports, under date of September 4, 1907, the arrival in Chicago in perfect condition, of our pineapples and avocados. This carload of fruit left Honolulu per Alameda, August 14, and arrived in Chicago late Saturday afternoon, August 31. The following Monday being Labor Day, the fruit was not opened for examination until September 3. Mr. Higgins states that out of the whole lot of pineapples sent, he had discovered, so far, only one defective fruit. A consignment of twenty-two dozen avocados which accompanied the pineapples, arrived in Chicago in good condition for immediate use.

This is a practical demonstration of the fact that pineapples and alligator pears can be shipped in good condition to any market which can be reached from Honolulu in twenty-one days, either by ocean or rail transportation. With the present lines of communication, this would include all mainland points between San Francisco and Chicago, all northern ports as far as Sitka, all Japanese ports, Vladivostok, Hongkong, Sydney and Melbourne. Those who engage in the pineapple industry in Hawaii need have no fear of producing a larger crop than can be marketed at present prices for many years to come.

Yours truly,

JARED G. SMITH,
Special Agent in Charge.

Hawaii Agricultural Experiment Station, Honolulu, Sept. 19,
1907.

BOARD OF AGRICULTURE AND FORESTRY.

Division of Forestry.

ROUTINE REPORTS.

Board of Commissioners of
Agriculture and Forestry,
Honolulu.

October 30, 1907.

Gentlemen:—

I have the honor to submit the following report covering the routine work of the Division of Forestry from July 29, 1907, to date.

During this period my own time has been taken up as follows: The first part of August was devoted to various routine matters connected with the work of the Division. Practically all of the time since August 20 I have been in the field, on trips to the other islands having to do with forest reserve projects, forest inspection and examinations of forest lands belonging to private corporations and individuals; the last under the offer contained in Circular No. 1 of this Division, wherein the Division agrees to give advice and assistance to owners of forest land in the management of their properties, according to the methods of forestry.

MAUI.

From August 20th to 31st I was on Maui, making an examination of the forest planting now going on on the lands of the Alexander and Baldwin interests, in several localities near Haiku; in an inspection of a portion of the proposed Makawao Forest Reserve, where there is a question of forest planting; in a visit to the rubber plantations at Nahiku; and in an examination of certain problems in the Koolau Forest Reserve. At Nahiku I saw in some detail the groves of the several plantations and discussed with the different managers various matters in connection with rubber growing.

Rubber at Nahiku.

So far as the growth of the trees goes the outlook at Nahiku is most promising and from all present indications a satisfactory yield of latex seems assured. The problems of finding the best method of tapping and harvesting the rubber, involving as they do the training of skilled workmen, now loom large, but I am

confident that a satisfactory solution will be found when the matter receives careful attention. With the trees growing at the present rate it will not be long before the older groves will be large enough to permit systematic experiments to be begun.

MOLOKAI.

Returning to Honolulu for a few days I was again away from September 3rd to September 8th on a trip to Molokai. This, my first visit to that island, gave me the opportunity to inspect the private forest reserve that has for a number of years been maintained on the central mountain of Molokai by the American Sugar Company; to investigate the question of the best method of handling the Algaroba forest to meet the varying demands of honey production, stock feed and utilization for fuel; and in general to get in touch with the conditions existing on the western half of that interesting island.

KONA, HAWAII.

On September 10th I started on the trip from which I have just returned. Going first to the Kona District on Hawaii I made as thorough an inspection of the forested area from Mt. Hualalai to the Kau District line as is possible, without the cutting of numerous and expensive trails through the forest. Using existing trails through the woods as a basis I made a general examination of the forest as a whole; including both government and private forest lands.

On this basis I am prepared to make recommendations for the government land, as well as to the several owners, as to methods of managing this area, in accordance with the principles of forestry. Such reports are now in preparation; they will later be brought to the attention of the Board.

The Forest Question in Kona.

In this connection it seems to me appropriate to repeat the statement, made in former reports of mine, that the forest question in this Territory has two very distinct aspects. On the windward side of the islands, especially Hawaii and Maui, in districts where there is living water in springs, brooks or streams that is either made use of locally, or impounded for the irrigation of lands more or less near at hand, the forest is mainly important as a protective cover, and as such should be kept as nearly intact as may be. On the leeward side of the islands, on the other hand, where the only living water is found in occasional springs, a different treatment is indicated. Here the forest, excepting always such areas as may be necessary to protect the liv-

ing water that does exist, is and ought to be considered in relation to its commercial value.

So in the Kona District, having carefully studied the situation on the ground, I am in favor of lumbering the mature trees, both Koa and Ohia, for I believe that if the work in the woods is properly done and the areas cut over are handled subsequently in an intelligent way, not only will a valuable industry be added to the Territory, but also that the forests themselves will be in better condition than at present.

Over considerable areas in Kona the large Koa trees are dying and in a few years will cease to have value either as a forest cover or as commercially important wood. The wise thing is to utilize this material while we may and then to manage the land on which it grew for the purpose for which it is best adapted. Some of the land now nominally under forest is unquestionably of greater value for grazing. Part of it can best be used for growing trees. The problem presented is to put it all to its best use, with due regard not only to strictly utilitarian use, but also to the indirect benefits which may result to the district from having a considerable body of forest on its mountain slopes. These points will be brought out in detail in my reports on the Kona lands.

Experimental Tree Planting.

Following my visit to Kona I spent three days at Waimea, selecting on the slope of Mauna Kea, several plots where can be carried on the cooperative tree planting experiments for which the U. S. Forest Service has recently supplied the funds. The areas selected are five acre plots on the unleased government land of Kaohe, at elevations of respectively 7,500, 9,000 and 11,000 feet. Here it is proposed to plant pines, spruces and firs from the temperate zone, with the expectation of finding a valuable tree that will grow on the higher slopes of our mountains, above the native forest. Similar experimental plots were also selected on the slope of Mt. Haleakala on Maui, as a part of my work on that island.

MAUI.

On October 4th I went over to Maui, remaining on that island till my return to Honolulu on October 24th. My visit to Maui consisted in a careful examination of the forest question in the Districts of Kula, Honuaula, Kahikinui and Kaupo, particularly in relation to government lands that are unleased or on which the leases will soon expire; in matters connected with the protection by a forest cover of the area adjoining the Waihou Spring on the government land of Makawao (Haleakala Tract); in the selection mentioned above of areas for experimental tree planting; and in an inspection of the tree planting work now being carried on by the Haleakala Ranch. Taking advantage of being

within easy reach I attended the Rubber Growers' meeting at Nahiku on October 12th, visiting some additional groves that I had not seen on my earlier trip and taking a part in the establishment of the Hawaiian Rubber Growers' Association. On the several questions investigated on Maui I shall in due course submit detailed reports to the Board.

ROUTINE MATTERS.

During the past three months the most important routine work in the Division of Forestry has been the exchange of seed with botanical gardens and other corporations and individuals in various parts of the world. Seed of many valuable trees and plants, new to the islands, have been received and are now being propagated in the Nursery.

Perhaps of the greatest present interest are two new species of rubber trees from Brazil, sent from Germany. They both belong to the genus *Manihot*, of which the Ceara rubber, so well known locally, has heretofore been considered the only rubber-producing species. Plants have been started at the Nursery and sent to Nahiku for trial. As is usual at this season of the year many trees and plants have recently been furnished to the schools for Arbor Day planting.

Nursery Grounds.

Thanks to the Superintendent of Public Works the work of improving the Government Nursery grounds is progressing favorably. Over 900 yards of earth have been hauled in to fill up the low lying part of the grounds and additional lots are daily being added. When the present improvements are completed the grounds will be in a more satisfactory condition than at any time in their history.

The new laboratory of the Division of Animal Industry was completed in September, and is now ready for occupancy.

Meetings.

The library room of the Board continues to be used for evening meetings of various organizations. Since July 29th the list is as follows:

Hawaiian Entomological Society, August 8th.

Hawaiian Poultry Association, September 10th.

Kaimuki-Palolo Improvement Club, October 25th.

Hawaiian Entomological Society, October 3rd.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

REPORT OF HORTICULTURAL-QUARANTINE INSPECTION WORK.

Honolulu, October 30, 1907.

To the Honorable Board of
Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—

Since my report to you, dated the 2nd instant, there have arrived twenty-five steam and sailing vessels from outside the Territory requiring inspection by this Department.

On October 3rd the S. S. "Hilonian" arrived from San Francisco and on board were found four crates of turnips infested with the larvae and pupae of the radish-cabbage root maggot (*Phorbia brassicae*). These vegetables, including the cases, were destroyed by fire.

On the 7th of October the S. S. "Sierra" brought from San Francisco five cases of quince badly infested with codling mouth larvae (*Carpocapsa pomonella*). This is not a new pest for that fruit but, as the quantity of worms found made the fruit practically worthless, the consignment was burned.

On October 11th the S. S. "Nippon Maru" brought 110 packages of rubber seeds, some of which had been damaged and were found to be swarming with a species of mite. The seeds were treated with the fumes of carbon bisulphide. Mites, as a rule, are difficult to destroy, but with the above chemical these succumbed readily in the course of an exposure of about two hours. The same chemical was again used in the disinfection of some infested imported Japanese rice.

Consignments of lemons and other fruits from Australia were ordered sent out of the Territory on account of the danger of introducing the fruit flies of that country.

Since my last report I have received an interesting letter from Mr. Geo. Compere, who is at present in India collecting beneficial insects for Western Australia and California. Mr. Compere has again succeeded in securing parasites upon fruit maggots, one species of which pest was introduced in the Territory some years ago, and has since practically wiped out the formerly profitable melon crops of these islands. Among the parasites secured by Mr. Compere, and being bred in India by him for introduction into West Australia, is one on cucumber, which will no doubt be beneficial to us here when introduced and established. Mr. Compere is meeting with many difficulties owing to distance in transportation, but states that he will this time be successful

in introducing these parasites into Western Australia, after which, in course of time, it will be easy for us to get them from the latter country.

This department has made another inspection of the young mango trees that have been propagated from imported Indian mango varieties, and has found them free from the "mango scale" (*Coccus mangiferae*) about which I previously reported. This is very satisfactory and it is hoped that parties who have purchased, or have been presented with trees of the above varieties, will notify the department so that we may make a free inspection of these and disinfect them if necessary.

Respectfully submitted,

ALEXANDER CRAW,

• Superintendent of Entomology and Inspector.

NOTES FROM THE REPORTS OF THE FOREST NURSERYMAN.

(October 2 and 30, 1907.)

PROPAGATION AND DISTRIBUTION OF PLANTS.

Owing to the large amount of seed which we are receiving in exchange for seed sent out some time ago, a large number of plants new to the Territory are being experimented with. The propagating house although small, is of great service in this work and it is kept full all the time. The demand for forest trees is increasing and a number of people have been making inquiries regarding the best trees to plant, methods of planting, etc. A number of orders are on file for large quantities of forest trees. Those are mostly from people in the neighborhood of Honolulu, and on this island. People on the other islands who want to do much planting are advised to grow their own trees; all instructions in propagating and planting being given and seed supplied at cost of collecting.

COLLECTING AND EXCHANGE OF SEED.

The collecting of seed has been continued. Our seed exchange list now numbers over 100 Botanic Gardens and other Institutions. The correspondence in connection with this work is taking up much of the writer's time. The demand for seed of the indigenous plants of the islands by the different Botanic Gardens is large. We are trying to get together all the native seed of

any consequence to be used for exchange purposes. Seed has been received as follows in exchange for seed sent out by us some time ago:

3	packages from	Yokohama Nursery Co., Yokohama, Japan.
31	"	Botanic Gardens, Hobart, Tasmania.
32	"	Botanic Gardens, Melbourne.
11	"	Botanic Gardens, Mysore, India.
14	"	Public Grounds & Plantation, Jamaica.
19	"	Public Works, Island of Guam.
2	"	Royal Botanic Gardens, Berlin, Germany.
177	"	Royal Botanic Gardens, Calcutta.
67	"	J. Staer, Seedsman, Wahronga, Australia.
27	"	Botanic Gardens, Straits Settlements.
37	"	Royal Botanic Gardens, Ceylon.
1	"	T. F. Sedgwick, Lima, Peru.
77	"	Botanic Gardens, Saharnpur, India.
4	"	Botanic Gardens, Aburi, Accra Gold Coast.
120	"	Botanic Gardens, Buitenzorg, Java.
8	"	Botanic Station, Uganda, British East Africa.

The most important consignment of seed received so far consists of two new varieties of the rubber-bearing *Manihot*, sent from the Royal Botanic Garden at Dahlem, near Berlin, Germany. In a letter from the Director, received Sept. 3, 1907, he has the following to say regarding the seed: "I beg to send with this the seed of two species of *Manihot* from the State of Bahia, Brazil. For the present one of these may be designated as *Manihot* from Jejuie, the other *Manihot* from Piauhy. Both are new species that should be immediately described under their scientific, botanical names. Both produce rubber." Previous to this introduction we have only had one species of rubber-bearing *Manihot*, namely *Manihot glaziovii* (Ceara rubber). Both new kinds have been started in the propagating house and are making a vigorous growth.

ADVICE AND ASSISTANCE.

A report with planting plan has been completed for the Hawaiian Fibre Co., Mr. Wm. Weinrich, Manager, for the land of Lower Pauhala, in Waikele, Ewa, Oahu. The whole tract contains approximately 2,000 acres and the land to be planted in trees about 400 acres.

WEED EXTERMINATOR.

A mixture of six pounds of white arsenic, five pounds of caustic soda and one gallon of water, is recommended for keeping street gutters and car lines free from weeds.

*FOREST NOTES OF OTHER COUNTRIES.**From Practical Forestry.*

In France, at Perigord, oak forests are planted for the truffles which grow upon their roots. It is said that three million dollars' worth of the fungus is annually exported.

In Italy acres of olive, walnut, willow and mulberry trees are grown in the fields, between which grain and potatoes are planted. The trees are pollarded and serve as props to grapes vines. The willow twigs are used to tie up the vines and the mulberry leaves furnish food for silkworms.

In Mexico rubber is grown as a shade to coffee.

Saxony, in Germany, with a population of three and a half millions and an area of nearly six thousand square miles, devotes more than a quarter of its land to productive forestry. The tree most grown there is spruce.

The swampy lands of Gascony were practically reclaimed by tree culture which added a new province to France.

In many countries of Europe willow trees are grown along the innumerable streams and ditches, and do double duty. The roots are useful to bind the banks and prevent the incroachment of the water, while the branches yield withes for basketry and the wood is used for sabots.

ARBOR DAY PROCLAMATION.

In accordance with custom, I hereby designate Friday, the 15th day of November, 1907, as Arbor Day for the Territory of Hawaii, and recommend that on that day appropriate exercises be held in all the schools of the Territory and that a part of the day be devoted to the planting of trees and shrubs.

Given under my hand and the Great Seal of the Territory of Hawaii at the Capitol, in Honolulu, this 31st day of October, A. D. 1907.

(Seal)

W. F. FREAR,
Governor of Hawaii.

By the Governor:

E. A. MOTT-SMITH,
Secretary of Hawaii.

NEW PUBLICATIONS.

FARMERS' BULLETIN 287.

Poultry Management. By G. Arthur Bell, Assistant Animal Husbandman, Bureau of Animal Industry. Pp. 48, figs. 14.

This bulletin deals with chicken raising, containing suggestions and directions for construction of poultry houses, selection of breeds, treatment and care of chicks and capons, remedies for diseases and bad habits of the fowls, methods of preserving eggs, etc. It is designed to supersede Farmers' Bulletins 41 and 141, entitled "Fowls: Care and Feeding" and "Poultry Raising on the Farm," respectively.

FARMERS' BULLETIN 298.

Food Value of Corn and Corn Products. By Charles D. Woods, Director, Maine Agricultural Experiment Station. Pp. 40, figs. 2.

History of the maize plant, with studies on the digestibility and food value of this cereal in its various uses. Corn breakfast foods, pop corn and green corn receive attention, and the use of raw corn and parched corn are considered. Milling and cooking are also features of the bulletin.

FARMERS' BULLETIN 304.

Growing and Curing Hops. By W. W. Stockberger, Expert, Drug-plant Investigations, Bureau of Plant Industry. Pp. 39, figs. 20.

This Bulletin gives the climatic and soil conditions essential to successful hop growing, directions for propagation, cultivation, pruning, training, picking, curing, and baling, with a statement as to cost and yield of crop, and suggestions for marketing.

FARMERS' BULLETIN 306,

Dodder in Relation to Farm Seeds. By F. H. Hillman, Assistant Botanist, Bureau of Plant Industry. Pp. 27, figs. 10.

Character and varieties of the dodder plant, its preference for certain host plants, kinds of seeds infested, relation to seed trade, directions for detection, description and illustrations of seed, buying and cleaning of clover and alfalfa seeds, detection and destruction of plants in the field, etc.

FARMERS' BULLETIN 308.

Game Laws for 1907. A Summary of the Provisions Relating to Seasons, Shipment, Sale, and Licenses. By T. S. Palmer, Henry Oldys, and Chas. E. Brewster, Assistants Biological Survey. Pp. 52, figs. 4.

PUBLICATIONS, BUREAU OF ANIMAL INDUSTRY.

CIRCULAR 24.

The Man Who Works with His Hands. Address of President Roosevelt at the Semi-Centennial Celebration of the Founding of Agricultural Colleges in the United States, at Lansing, Mich., May 31, 1907. Pp. 14.

CIRCULAR 112.

Relative Proportions of the Sexes in Litters of Pigs. By George M. Rommel, Animal Husbandman. P. 1.

CIRCULAR 113.

Classification of American Carriage Horses. Pp. 4.

AGRICULTURAL NOTES.

HERD OF BULLS.

The finest herd of blooded cattle that has ever been imported to Hawaii was brought by a recent Hilonian. The herd consists of thirty-three bulls consigned to the Parker Ranch, the American Sugar Company Ranch and to John Hind. The animals were selected by Mr. Fred. L. Carter and consist of pure-bred Herefords, Shorthorns and Devons.

POULTRY SHOW.

The Farmers' Institute of Hawaii will again unite with the Hawaiian Poultry Breeders' Association in making a general agricultural exhibition in connection with the December Poultry Show. It is hoped that Forester readers will assist in the success of this enterprise by contributing exhibits of fruits, flowers, vegetables, poultry and other produce.

THE ALGAROBA.

The great value of the algaroba is illustrated by the condition of a tract of land between Kihei and Maalaea Bay, Maui, which some years ago was so sterile as to be valueless. Application has now been made for its opening to settlement by a number of native Hawaiians, who wish to devote it to agricultural purposes. The improvement in the land is solely due to a growth of algaroba with which it has become covered.

WEED KILLER.

Application for patenting an invention which should prove of great value to sugar planters has lately been made by Mr. T. J.

Ryan of Hawaii. The proposed machine is intended to burn away weeds by means of a series of burners operating below the body of the apparatus.

PINEAPPLE EXPORT.

The largest shipment of canned pineapples ever made from this Territory was dispatched on the Hilonian which left Honolulu on November 6th with 20,300 cases. The total value of the consignment was about \$80,000, and it is confidently predicted by growers that within the next few seasons shipments of this size will be frequent.

REFINED SUGAR.

The manufacture of refined sugar upon the plantations is gaining in popularity. The practice has lately been adopted at Aiea which has produced a most excellent article from its new refinery.

TAPIOCA.

Mr. J. W. Conradt is reported to be about to establish a small factory in Hamakua for the manufacture of tapioca starch. It is intended to construct a small mill capable of producing one ton of tapioca a day. Tapioca starch is by many preferred to corn starch for culinary purposes and is also of great value in the laundry.

HONOLULU ENTERPRISE.

The Honolulu Iron Works has for some time been engaged in the manufacture of three complete sugar mills for operation in Formosa. The first of these is already nearly installed, and will be ready for operation early next year. The new plant has a capacity of 65 tons of sugar per diem and is complete in every detail. The remaining plants will have capacities of 150 and 120 tons of sugar daily, respectively.

CATTLE.

The supply of cattle upon the various island ranches is said to be in excess of the present market demand.

RAILWAY EXTENSION.

The Kona Agricultural Company, the Kona Development Company and the West Hawaiian Railway Company have together authorized an issue of \$1,000,000 of bonds for the purpose of railroad extension. The road will be used for the conveyance of passengers and freight and also for transporting sugar cane to the mill of the Kona Development Company. Thirty-two miles of track are already in operation and the new extension, which will permit seaport connection at Kealakekua Bay, will greatly extend the possibilities of the development of North and South Kona.

HAWAIIANS AS AGRICULTURISTS.

The native Hawaiians on Maui, encouraged by the good prospect of the rubber industry are engaging in this new enterprise. Many of them have also commenced to cultivate pineapples and grapes with every promise of success. The development of these industries among the Hawaiians is in part due to the exemption from taxation of land devoted to new industries and also to direct encouragement by local planters. The attempt to induce the Hawaiians to return to the pursuit of agriculture is a most praiseworthy one and its beneficial influence should be most marked.

FRUIT TRADE POSSIBILITIES.

The extraordinary possibility of the development of the Hawaiian export fruit trade may be in some measure gauged by the fact that the port of Celba, on the north coast of Honduras, a town about one-sixth the size of Honolulu, dispatches some twenty steamers of tropical fruit monthly to New Orleans and Mobile. The demonstration which has lately been made of the practicability of shipping pineapples and other Hawaiian grown fruits in good condition to Chicago, has opened up the whole of the western and middle States to our trade. The extension of our export fruit trade must follow as a matter of course, and during the next few years this will rank as one of the most important factors in the development of Hawaii.

RUBBER SEEDS.

The Nahiku Rubber Company has recently received a shipment of 210,000 Hevea rubber seeds. Of these 5,000 are to be planted at Koolau, 10,000 in Honolulu for experimental purposes, and 190,000 are to be planted at Nahiku.

BRAZIL RUBBER EXPORTS.

A Consular report, just published, from Para, states that last year the amount of rubber exported reached a total of 35,000 tons. The increased demand kept the prices high, and it is expected that the present level will be maintained, as the output of rubber from other countries has not affected the Brazilian qualities.

TO RECOVER WASTE RUBBER.

A process is in operation in France, whereby it is claimed all the effective rubber can be recovered from "perished" rubber. The process is said to be not expensive, and to fully repay its cost.

VOL. IV

DECEMBER, 1907

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform Hawaiian readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER & AGRICULTURIST

VOL. IV

DECEMBER, 1907

No. 12

One of the most important works before the economic botanist in Hawaii is the compilation of a popular treatise upon the imported and native weed plants of Hawaii. The value of such a work to the stock raiser, and to all cultivators of agricultural crops would be very great, and we hope to see the matter, ere long, taken in hand. Not only the useless and harmless weed invaders of cultivated land require to be treated in such a work, but also all poisonous and otherwise injurious plants. A botanical and a popular description of each species, accompanied by a good illustration, and also an account of the best means of eradicating it, would form a most valuable addition to local agricultural literature. Much excellent work, of this nature, has lately appeared in the agricultural periodical literature of the British Colonies and in some cases admirable colored illustrations have accompanied the descriptions of the important specimens.

Many of the exotic weed plants of the Hawaiian Islands are well known and need no introduction to the agriculturists. However, it would come within the province of such a work as the one suggested to endeavor to attract attention to the possible economic value of plants which are now merely regarded as cumberers of the ground. Of such plants the *kolu* (mimosa) deserves especial mention. As is well known the blossoms of this plant afford a most valuable perfume, and in southern France a large population is engaged in the cultivation of the plant. In Hawaii, where the mimosa grows so luxuriantly, there should be a future before the grower of this plant for perfumery purposes, if the difficulties of the labor of gathering the blossoms could be successfully met. Probably a solution of the difficulty could be by the employment of children. No more healthful and picturesque an industry could be established near Honolulu than that of the cultivation of mimosa for perfumery purposes.

Among plants offering similar obstruction to the agriculturist are the guava and the lantana, the methods of eradication of which are similar to those required in the case of mimosa. In the case of the lantana the possibilities of discovering an economic use are slight, although it has been suggested that tannin may be extracted from it, and we have also seen it reported that its blossoms afford a perfumery useful for soap. The guava, how-

ever, offers greater promise, and the systematic cultivation of this fruit both for the manufacture of preserves, and also for the development of a dessert fruit, are worthy of trial.

The prickly-pear in these islands has not generally proved a very bad pest, although the experience of other countries has not been so fortunate. In Europe and northern Africa several delicious edible varieties of prickly-pear are grown, and would without doubt succeed well in Hawaii.

One of the most objectionable weeds near Honolulu is that appropriately designated the "stink-vine" (*mailepilau*). This unwelcome intruder has taken almost complete possession of some spots favorable to its growth, where it fills the air with its unpleasant odor and is effectually choking out both native and introduced plants. The sight of a graceful pandanus struggling beneath masses of this repulsive vine is one of the most regrettable of the silent tragedies of plant life. It is to be hoped that some way will soon be found to exterminate this undesirable weed.

There are also in the Hawaiian Islands many obnoxious introduced plants of less notoriety than those named, but whose control is none the less desirable. In many cases if the danger of allowing such weeds to spread were made known by the publication of suitable information, the pest could be often controlled and prevented from being spread wide cast through the islands. Among such useless, and often actively harmful plants, may be included several persistent grasses and other smaller weeds, which unless kept in check are likely to prove a menace to pastures and cultivated land. Many such useless weeds infest the house lot and are even ready to take possession of lawns and flower beds whenever, through lack of knowledge or other reason, they are not continually checked.

The unwelcome species are not confined to introduced offenders, but some native plants should be placed under the ban or at least looked upon with suspicion. Many a plant which in its native habitat finds a proper place in the economy of the flora, may possess inherent qualities, which when allowed to develop under artificial surroundings may develop extraordinary powers of inflicting harm upon cultivated crops. In this respect it is perhaps well to call attention to a native plant which has till now remained unheeded, except by the few who have assisted its spread from an appreciation of its fancied ornamental appearance. We refer to the *kaunaoa*, an aerial vine made use of by the natives for yellow leis. The propensity of this creeper to grow on many hosts has assisted its distribution and colonies of it are often established by the natives in convenient localities. The *kaunaoa* is evidently closely related to the European pest "Dodder" which has played havoc with many cultivated crops in Germany and England. The latter plant is a true parasite, apparently a degenerate convolvolous, devoid of leaves. It has the faculty of penetrating the bark of many plants upon which it derives nour-

ishment by suctorial rootlets embedded in the bark of the host. The general habit of the kaunaoa mark it as a plant which should be encouraged to spread beyond its native confines, as little as possible.

In a complete compilation of obnoxious weeds a list of those plants whose structure harbors mosquito larvae, and whose cultivation is therefore undesirable near habitations, would also find an appropriate place.

THE FARMERS' INSTITUTE OF THE TERRITORY OF HAWAII.

Honolulu, Hawaii, December 17, 1907.

Editor, Hawaiian Forester:

The second annual agricultural exhibit under the auspices of the Farmers' Institute of Hawaii, and in coöperation with the Hawaiian Poultry Association's third annual exhibition, will be held in the Drill Shed, Honolulu, January 8-11, 1908.

The Farmers' Institute invites the hearty coöperation of all agriculturists and amateur gardeners of the Territory to make this second exhibition the best possible representation of the varied and bountiful resources of our soils and climate.

It is the aim of the Institute to make this agricultural exhibition representative of all the Islands and as diversified as possible.

Entries covering a wide range of products of the farm, orchard and garden have been provided for, and in recognition of the best display, a first and second prize, consisting of a blue and a red ribbon, respectively, will be awarded in each class of exhibits.

To further encourage exhibits from the other Islands, the Inter-Island Steam Navigation Company has generously offered to transport, free of charge, all exhibits shipped from points touched by their steamers. Upon arrival in Honolulu, such exhibits will be cared for by the Farmers' Institute. No entrance fee will be charged.

A detailed list of exhibits will be published within a few days. Communications should be addressed to

F. G. KRAUSS,
Secretary, Farmers' Institute, Honolulu.

PROGRESS OF FORESTRY IN HAWAII DURING 1907.**PAPER READ BEFORE THE HAWAIIAN SUGAR
PLANTERS' ASSOCIATION.**

BY RALPH S. HOSMER,
Superintendent of Forestry of the Territory of Hawaii.

(November 13, 1907.)

Members of the Hawaiian Sugar Planters' Association:

Gentlemen: Following the precedent of former years, the chairman of your Committee on Forestry has again asked me to appear before the Association with a statement of the progress of forestry in the Territory during the past year. This I am glad to do, for the Hawaiian Sugar Planters' Association is one of the forces that is always to be counted on for active coöperation and support in the furtherance of forestry in the islands.

Forest work in Hawaii naturally divides itself into that carried on by the Territorial Division of Forestry and that done by private individuals and corporations. It may be treated accordingly.

FOREST RESERVES.

In the activities of the Division of Forestry the creation of forest reserves continues to hold chief place. Since the last meeting of this Association, three additional forest reserves have been declared, as follows: Lualualei on Oahu, Hana on Maui, and Na Pali-Kona on Kauai. The area of government land in these reserves is, respectively, 3,743, 13,767, and 40,650 acres, or a total of 58,160 acres. Within the boundaries of the Hana Forest Reserve are also 1,058 acres of privately owned land; within the Na Pali Forest Reserve 19,890 acres are in private ownership.

Other forest reserve projects now awaiting final action are the proposed West Maui Forest Reserve, containing a total area of 44,440 acres; the proposed Makawao Forest Reserve, also on Maui, 1,796 acres; and a section of the land of Honolulu, Oahu, which will make with the areas already set apart on that range a good sized forest reserve on the Waianae Hills. Within a short time the boundary of the proposed Kohala Mountain Forest Reserve will be located on the ground, when this project can be acted upon.

Each of the forest reserves set apart during the past year is made with the idea of protecting the forest on the water-

sheds of streams important for irrigation, power development or other use. They are all essentially "protection forests" and as such it is desirable that the forest within their boundaries be kept strictly intact. The same statement holds true of the projected reserves on Maui and on the Kohala Mountain.

Change in the Forest Reserve Law.

At the last session of the Legislature, during the spring of 1907, a very important step in forest work was taken when the forest reserve law was so amended as to permit the Governor to set apart government land within the forest reserve boundaries, whether it is under lease or not. It is specifically provided that such action shall be subject to existing leases, but being set apart, at the expiration of the lease the land automatically comes into the class of land definitely reserved. The advantage of this is that it leaves no uncertainty as to what the government's policy will be in regard to given forest tracts. It also makes for permanency in the management of the various reserves.

FOREST UTILIZATION.

During the last year and especially during the last two months much interest has been awakened in the subject of the utilization of the Hawaiian forests for Koa lumber and Ohia Lehua railroad ties. This development of what promises to be an additional industry to the Territory deserves special comment for it involves questions of forest policy of vital importance.

Two Classes of Forest.

It is perhaps pertinent at this juncture to consider certain essential differences between the two main classes of forest in Hawaii. As I have pointed out in previous reports the primary importance of the Hawaiian forests lies in their value as a protective cover on the watersheds of the streams of the Territory, of which the water is needed for irrigation, power development, domestic supply and other uses. In practically all of the forest reserves on the windward side of the islands, or in districts where the reserve protects permanently running streams or springs, the forest cover should be kept intact, in order that the forest as a whole, including both the trees of the main stand and the shrubs and smaller plants of the undergrowth, may exercise to the full their function of retarding the run-off and thus helping to maintain a moderately even flow in the streams. For this reason I reported adversely, last July, on a proposition to lumber the forest on the government

land of Piihonua, Hawaii, in the Hilo Forest Reserve, on the ground that the opening up of the forest on that land would be detrimental to the favorable conditions existing on the drainage basin of one of the most valuable streams in the Territory—the Wailuku River.

The Commercial Forest.

On the leeward side of the islands, however, and in districts where because of topography and other factors there is no permanently running water, a quite different condition obtains. Here the commercial value of the forest takes first place in an estimate of its worth. Especially is this true of Hawaii and particularly of the Kona District, although it also holds good of sections of Kau and Puna. It is hardly necessary to remark that in the utilization of the forests in these districts the work ought to be done with due regard to the future. Except in localities where it is obvious that the land can be used to better advantage for other purposes than growing trees, the indication is for methods of conservative lumbering, whereby the mature trees of merchantable value now on the land may be removed in such a way that the forest will be left in good producing condition, which will in time permit the harvesting of other crops. Fortunately for the Territory the owners of the large private estates are alive to the importance of handling their forest properties in accordance with the methods of practical forestry, so that there is every reason to expect that the major part of the lumbering done will be carried on in a systematic and carefully planned manner. This being the case the advent of this new industry is to be welcomed as a development of much importance to the Territory.

TREE PLANTING ON WASTE LANDS.

Outside of the work in connection with forest reserves the energies of the Division of Forestry during the past year have been mainly directed (1) toward coöperative assistance to individuals and corporations desiring to plant trees and (2) to the introduction of exotic trees and shrubs of value to the Territory. Under its offer of assistance to private owners the Division of Forestry stands ready at all times to prepare planting plans for persons desiring to establish groves or plantations of forest trees, or who wish to do other forest work. This matter should be of peculiar interest to the members of this Association for there is hardly a sugar plantation on the islands but that has some areas of waste land that might well be devoted to the growing of trees. With the increasing scarcity of fuel that is being felt in many districts

and, with the steady rise in price of the lumber needed for various uses on the plantation, it needs no argument to show the advantage of a local supply, even though it meets only a part of the demand.

A number of the sugar plantations on each of the islands have undertaken and are carrying on tree planting work, but there are many areas of waste land that still wait to be made productive. The offer of the Division of Forestry to assist in this work, is a standing one; the members of the staff are ready at all times to undertake the work.

PLANT INTRODUCTION.

In the introduction of exotic plants the past year has seen marked progress. Through the exchange of Hawaiian grown seed of native and introduced plants, seed of many valuable trees new to the islands has been received. This seed is being started at the Government Nursery. In due course the trees resulting will be planted out in suitable situations where they can be carefully watched; those that are found to be of value will eventually be propagated and generally distributed. The results of this work can but be of value to the Territory.

Another item of considerable interest in this connection is the inauguration of systematic experiments with temperate zone trees—pines, spruces and firs—on the higher slopes of Mauna Kea and Haleakala. This work is done with the coöperation of the Federal Forest Service, from whose appropriation for this fiscal year an allotment of two thousand dollars has been made for this purpose.

RUBBER.

The rubber industry of the Territory continues to develop with every sign of promise. It is as yet too soon to regard it as fully established but everything points to the time when rubber will take its regular place as one of the important "allied industries." Perhaps the most notable event of the year in connection with rubber was the successful convention held at Nahiku in October, 1907,—"the first rubber convention ever held on American soil" as the papers had it—when was organized the Hawaiian Rubber Growers' Association, with the object of providing an organization which it is hoped will benefit the rubber industry in somewhat the same way that the Hawaiian Sugar Planters' Association has benefitted sugar.

To sum up: The past year may well be considered one of progress in forestry in Hawaii, for while the things actually accomplished may not in themselves be striking they nevertheless play an important part as units in the building up of the structure on which we are all at work, the development of the general prosperity of the Territory.

AN IMPORTANT LEGAL OPINION.

At the instance of the Board of Agriculture and Forestry, the Attorney General of the Territory of Hawaii, Honorable C. R. Hemenway, has recently handed down an opinion which, because of its far-reaching effects, is of the utmost importance to the Board, besides being a matter of much moment in the forest history of Hawaii.

The question at issue was whether or not the Board had the right to sell products from forest reserves and to use the realizations so received as a special fund for other forest work, it having been claimed by some that the law as it stands was unconstitutional in this section.

Based on an exhaustive statement of the various conditions entering the case, the Attorney General rules that the Board may properly dispose of forest products and use the money accruing therefrom for the purposes for which it is organized.

This matter is of fundamental importance to the Territory's forest work, and of such general interest that Attorney General Hemenway's opinion is here reproduced in full, as follows:

EXECUTIVE BUILDING.**OFFICE OF THE ATTORNEY GENERAL.**

Honolulu, Hawaii, November 19, 1907.

OPINION NO. 42.

Honorable E. A. Mott-Smith,
Secretary of Hawaii,
Honolulu, T. H.

DEAR SIR:

In response to your verbal request for the opinion of this Department, as to whether the Board of Agriculture and Forestry has power to sell wood to be cut upon forest reserves, and other products of such forest reserves, and whether the realizations from such sales can properly be expended for the replanting of portions of such forest reserves, we would advise you as follows:

For a proper understanding of the question involved, it seems necessary to review the various statutes relating to forestry which have from time to time been in force in Hawaii.

The first legislature enactment on the subject of forestry was "An Act for the Protection and Preservation of Woods and Forests," Ch. 30 S. L. 1876, (Appendix, R. L. P. 1281).

This act, by Section 1, authorized the Minister of the Interior

"to set apart and cause to be protected from damage such woods and forest lands, the property of the government, as may in his opinion be best suited for the protection of water sources, and the supply of timber and fruit trees, cabinet woods and valuable shrubbery." He was also authorized, by Section 3, "to secure from the Commissioners of Crown Lands, by lease or otherwise, such woods and lands being the property of the Crown, as may be suitable for carrying out the purposes set forth in this Act." The same officer was further given authority, by Section 2, to appoint a superintendent of woods and forests whose duty it was to carry out such rules and regulations as might be established for the protection of "Reserved woods and forest lands." While the power to make such rules and regulations is not expressly given, it is one which is necessarily implied from the provisions quoted. Under this act of the legislature, therefore, certain portions of the public domain might be set apart for special purposes and became then a separate class of land to be utilized in one way only.

By the "Act to Establish a Bureau of Agriculture and Forestry," Ch. 81, S. L. 1892 (Appendix R. L. P. 1285) the execution of the law above referred to was made one of the duties of such Bureau, which consisted of the Minister of the Interior, as President ex-officio, and four other persons appointed by him with the approval of the Cabinet. Whether the Bureau thereby became authorized to set apart government lands for forest reservation is doubtful, but such Bureau clearly was charged with the duty of caring for such reservations when made. The Minister of the Interior having the care and control of government lands, being given express authority to set them apart for forest reservations, and being ex-officio President of the Bureau of Agriculture and Forestry, it may be argued that the legislature saw no need of expressly transferring the power to make such reservations inasmuch as no conflict of authority was likely to occur.

Section 9 of said Land Act "to make, alter and revoke rules and regulations * * * for the protection of forests and reservations for forest growth."

The Land Act did not expressly repeal or amend the provisions of the "Act to Establish a Bureau of Agriculture and Forestry," Ch. 81, S. L. 1892 (Appendix, R. L. P. 1285), referred to above. On the contrary it must be studied in the light of such act, and construed, if possible so as not to conflict with the provisions of such. The question arises, therefore, as to what effect the Land Act had on the previous provisions of law.

It will be noted that forest reservations heretofore made remained under the control of the Minister of the Interior, who also was to take charge of all reservations of public lands thereafter made for "public purposes." It will also be noted that the Commissioners of Public Lands were placed in charge of all public lands, except certain designated classes, and that when lands were set apart by them "for public purposes" such lands thereupon

passed under the control of the Minister of the Interior. Express power to make forest reservations was not given the Commissioners, and this power, if given, must be implied from the provisions of Section 2 that "all land hereafter reserved by the Commissioners for public purposes, shall thereupon at once pass under the control and management of the Minister of the Interior" and from the power given in Section 9 to make rules and regulations respecting "forests and reservations for forest growth." It might, therefore, seem that the power theretofore existing in the Minister of the Interior to set apart forest reservations was by the Land Act transferred to and lodged in the Commissioners of Public Lands, and that such reservations when made by such act immediately passed out of the control of said Commissioners and into the control of said Minister, or therefore into the control of the Bureau of Agriculture and Forestry of which said Minister was ex-officio President. But it must not be forgotten that the Minister was by law one of the Commissioners of Public Lands so that again it may be reasonably concluded that the Legislature anticipated no conflict of authority and therefore felt that there was no need to more clearly define the limits of the powers to be exercised by the Minister of the Interior on the one hand and the Commissioner of Public Lands on the other.

It must also be borne in mind that the purpose of the Land Act differs widely from that of the Forestry Laws. The former was designed chiefly with the object in view of settling the land and causing it to produce immediate money revenue, while the latter was intended to conserve the water and timber supply for the purpose not of immediate gain, but of future and continuous benefit to the entire country.

That the general policy of making such reservations was approved and intended to be continued in force is shown by the fact that the existing law as to forestry was not specifically amended or repealed by the Land Act.

Such being the case, and in order to give effect to both provisions of law, which should be construed, if possible, so that each may stand, it may be fairly held that the power of the Minister and Bureau to make forest reservations was continued and that the Commissioners were intended to have authority to make rules and regulations only as to forest lands not formally "reserved," while the Bureau retained authority to make such rules for actual forest reservations under its control. By such a construction the spirit and intent of all legislation on the subject would be conserved.

It therefore, would appear that the true intent of the various acts under consideration was that such lands should be set apart for a forest reservation as the Minister of the Interior, under the direction of the Bureau, should consider necessary for such purpose, and that such land should thereupon pass to the exclusive control of such Minister subject as to management to the advice

and supervisory care of the Bureau of Agriculture and Forestry.

If such is the proper construction of these enactments, then at the time the Organic Act went into effect, the Minister of the Interior still possessed the power to effect a reservation of portion of the public domain for forestry purposes, which when so set apart passed into the control of the Bureau of Agriculture and Forestry.

By Section 73 of the Organic Act the land laws of Hawaii were continued in force until Congress should otherwise provide, the only change being that one officer performs the duties and exercises the powers formerly performed and exercised by the Commissioners. By Section 74 of said Organic Act the laws relating to Agriculture and Forestry also remained the same, but subject to modification both by Congress and the local legislature. By Section 75 of said Act the Superintendent of Public Works was given the powers and duties of the former Minister of the Interior with regard, among other things, to "other grounds and lands now under the control and management of the Minister of the Interior," and subject to change by the Legislature of Hawaii.

Just what the "land laws" of Hawaii were, as the term is used by Congress, is not altogether clear. Beyond question the Commissioner of Public Lands has the power and is charged with the duties of the former Commissioners of Public Lands, one of whom was the Minister of the Interior. It is also clear that the Superintendent of Public Works was given the custody and control of lands set apart for various public purposes and formerly in charge of the Minister of the Interior. A distinction clearly exists as to the general powers and duties of these officers in that the Congress alone may modify those of the Commissioner of Public Lands, while both Congress and the local legislature may change those of the Superintendent of Public Works. But has the Commissioner of Public Lands the sole or any authority to set apart and reserve portions of the public domain for forestry purposes or is that power one which Congress intended to and did leave to some other officer?

If the Commissioner has such authority then Chapter 14, S. L. 1903 (Ch. 28 R. L.), creating the Board of Agriculture and Forestry is valueless to the extent that it attempts to authorize the Governor to make such reservations; if, however, some other officer had such authority, then the provisions of said Chapter are valid. If the reasoning above is sound, and the Commissioner has no such power under the "Land Act," then his power, if any, must be found in the Organic Act.

From the fact that the laws relating to agriculture and forestry were continued in force until modified with the single change that a single commissioner should perform the duties formally required of the Bureau, it would appear that Congress realized the necessity of making the care and protection of forest reservations the special duty of some officer, or set of officers, and approved of

the existing system. If so, then Congress certainly intended to provide for the creation of forest reservations by the act of some authorized officer. Section 1 of Chapter 30, S. L. 1876, which authorized the Minister of the Interior or the Bureau of Agriculture and Forestry to make such reservations was still a part of the statute law, but the office of Minister of the Interior ceased, and the powers exercised by him were divided among several officers, to-wit, the attorney general, treasurer, superintendent of public works, and commissioner of public lands, but an examination of the provisions of the Organic Act as to the powers and duties of these officers shows that no one of them succeeded to this particular power, and it is necessary to look farther or to conclude that Congress failed of its purpose.

By Section 68 of the Organic Act, the Governor was given "all the powers and duties, which by the law of Hawaii, are conferred upon or required of * * * any minister of the Republic of Hawaii (acting alone or in connection with any other officer or person or body) * * * and not inconsistent with the Constitution and laws of the United States." Under this provision it may be fairly considered that the power to create forest reservations was transferred by Congress to the Governor. By such holding full effect is given to the intent of Congress in continuing in force the local laws relating to agriculture and forestry and the full purpose of such laws could be carried out. It is our opinion then, that after the passage of the Organic Act the Governor had power to withdraw lands from the control of the Land Commissioner for forestry purposes, and that such lands so reserved then passed under the control of the Bureau of Agriculture and Forestry. This power is not inconsistent with the powers of the Commissioner of Public Lands, but is entirely separate and distinct therefrom. The Commissioner was not given nor intended to have all powers relative to the use and control of all public lands, but only those formerly exercised by the Commissioners of Public Lands, and the Land Act as pointed out above gave certain distinct powers exercised by the former Minister of the Interior, to the Superintendent of Public Works.

This was the status of the law until the passage of Chapter 44, S. L. 1903 (Ch. 28 R. L.), creating the Board of Agriculture and Forestry, which is the statute under which forest reservations are now handled. It is clear that the Legislature was given power by Section 74 of the Organic Act to enact this statute. The question, therefore, comes down to a construction of this statute and it must be determined whether by it the Board has authority to manage and control all forest reservations with power to sell their produce or whether any of such powers have been transferred to the Commissioner of Public Lands.

By Section 397 R. L., the power to set aside lands as forest reservations is continued in the Governor and made subject to the approval of the Board, a public hearing being first had.

Under subdivision 6 of Section 377, R. L., and Section 379, R. L., government lands, when set apart for forest reserves are declared to be under the care, custody and control of the Board of Agriculture and Forestry, the executive officer of which also has all powers and duties vested before April 25, 1903, in the Commissioner of Agriculture and Forestry. (Sec. 373 R. L. as amended by Act 106, S. L. 1907.)

Subdivisions 7 and 8 of Section 377, R. L., which section defines the duty of the Board, read as follows:

"7 PROTECTION OF FORESTS AND WATER SUPPLY. To devise ways and means of protecting, extending, increasing, and utilizing the forests and forest reserves, more particularly for protecting and developing the springs, streams and sources of water supply, so as to increase and make such water supply available for use;

"8. SELF-SUPPORT OF FORESTS. To devise and carry into operation, ways and means by which forests and forest reservations can, with due regard to the main objects in this chapter set forth, be made self-supporting in whole or in part"

The duty to protect, extend, increase and utilize forests and forest reserves, and to devise and carry into operation ways and means by which forests and forest reserves can be made self-supporting, carries with it such power as is necessary to properly perform such duty. If in the due performance of the duty thus laid on the Board of Agriculture and Forestry it becomes necessary for the Board to cut and remove a portion of the timber in the forest reserve, the Board would have power to do so; and in order to carry out the duty of devising ways and means of making forests and forest reserves self-supporting, the Board would have power to sell timber so cut. The exercise in any case of a power by the Board must be limited by the necessity for its use in order to perform properly a duty laid upon it, and only the power necessary to perform such duty is given it. While the power of the Board to cut and remove wood upon forest reserves is an implied power only, yet the provisions of Section 385 of the Revised Laws seem to indicate that the legislature intended to authorize the Board to exercise just such power whenever it was necessary for the protection, increase, or extension of forests and forest reserves. That section reads as follows:

"Sec. 385. INCOME FROM FOREST RESERVES. In case any money shall accrue from any forest reserve, or the products thereof, the same shall be deposited in the treasury as a special fund for the preservation, extension and utilization of forests and available for use under this chapter, subject to withdrawal and use in the same manner as moneys appropriated by the legislature."

By this section it seems clear that the purpose of the legislature was to permit the expenditure of moneys realized from the products of the forests, such as timber, for the purpose of general improvement of the forest lands set apart as reservations, and unless the legislature contemplated that moneys would be realized by such sales, the presence of this section in the law would be valueless.

The conclusion drawn is that the reservation of forest lands may properly be done by the Governor; that when so done the lands come under the control of the Board of Agriculture and Forestry, passing out of the hands of the Commissioner of Public Lands, that said Board is empowered to dispose of such products of the forests as are necessarily taken therefrom to carry out the purposes of this act and to enable a proper performance of the general duty to protect, extend, increase and utilize the forest with a view to rendering the same self-supporting in whole or in part; and that the proceeds of a sale of such products may be deposited in the Treasury as a special fund and used by the Board for the purposes set out in Section 385 R. L.

Very truly yours,

(Signed) C. R. HEMENWAY,
Attorney General.

NEW PUBLICATIONS.

FARMERS' BULLETIN NO. 307.

Roselle: Its Culture and Uses. By P. J. Wester, Special Agent. Pp. 16, figs. 6.

History, geographical distribution, botanical characteristics, varieties, cultivation, uses, etc., of the roselle plant, with a statement of its composition, its fungous diseases and insect enemies.

FARMERS' BULLETIN NO. 309.

Experiment Station Work, XLIII, Compiled from the Publications of the Agricultural Experiment Stations. Pp. 32.

Contents: Ice for household—Culture and varieties of root crops—Cowpeas and soy beans—Silage from frosted corn—Co-operation in marketing crops—Incubation of eggs—Causes of death of young chicks—Snow for poultry—Eradication of cattle ticks—Bacteria in cream.

BOARD OF AGRICULTURE AND FORESTRY.**Division of Forestry.****ROUTINE REPORTS.**

Board of Commissioners of
Agriculture and Forestry;
Honolulu.

November 20, 1907.

Gentlemen:

I have the honor to submit the following report for the period from October 30th, 1907, to date:

My own time during this period has been mainly occupied in the preparation of reports on several matters referred to me by the Committee on Forestry and in the regular routine work of the Division of Forestry.

On November 13th, at the request of the Secretary and the Chairman of the Committee on Forestry of that organization, I read a paper on "the progress of forestry in Hawaii during the past year," before the Hawaiian Sugar Planters' Association. At the same meeting, Mr. L. A. Thurston, the Chairman of the Committee on Forestry, presented an exceedingly able statement that set forth in a comprehensive way how the diminishing timber supply on the American mainland directly affects the forest question in Hawaii and how, consequently, it is essential to the continued well being of these islands that a rational forest policy be adhered to. Mr. Thurston's address was published in full in the Advertiser of November 15th, 1907. It will repay careful reading and thoughtful consideration.

By proclamation of Governor Frear, Arbor Day was this year observed on Friday, November 15. As usual the celebration of the day was principally by the schools. In Mr. Haugs' report will be found a statement of the number of trees sent out from the Government Nursery for Arbor Day planting.

Since October 30 the library room of the Board has been used for evening meetings, as follows:

Honolulu Improvement Advisory Board, November 5.

Hawaiian Poultry Association, November 12.

" " " " 18.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

from the report of the Forest Nurseryman.

ARBOR DAY.

sent out for Arbor Day planting, with number of
ands, is as follows:

ds.	Schools.	Plants.
i	10	133
aii	7	280
ii	2	42
i	5	180
okai	4	889
	—	—
	28	1524

NURSERY.

sand seeds of Para rubber (*Hevea brasiliensis*) are
ited at the request of Commissioner Giffard. The
ived in first class condition and is sprouting splen-

ousand seeds belonging to the Castle Estate are also
rously and will require to be taken to their destina-
planted in the course of a week or two.

f improving the Nursery grounds is still progress-
es are being pruned with the object of making them
ical and allowing more light to the grass.

LECTING AND DISTRIBUTION OF SEEDS.

ges of seed of the Grass tree (*Xanthorrhoea hastilis*)
from Mrs. Hans Isenberg, Lihue, Kauai.

re:

from Imperial Biological Institute, Amani, Port
German East Africa.

from Acclimatization Society Gardens, Brisbane,
land.

from Harvard Experiment Station, Soledad, Cien-
Cuba.

ng of island grown seed has been continued; a large
ays kept in stock.

THE RUBBER CONVENTION.

verence, in the report of the Rubber Convention at
i, which appeared in the October number of the
speech of Governor Frear was attributed to Mr.
I apologize to all concerned for this transposition of

OUR NATURAL RESOURCES.

In a circular letter addressed by President Roosevelt to the Governors of the States, the importance of conserving for future generations the natural resources of the nation are urged at some length. The subject is one which no thoughtful man can view with unconcern, and is so important that we print the letter alluded to, verbatim:

The White House,
Washington, November 11, 1907.

My Dear Governor: The natural resources of the territory of the United States were, at the time of settlement, richer, more varied, and more available than those of any other equal area on the surface of the earth. The development of these resources has given us, for more than a century, a rate of increase in population and wealth undreamed of by the men who founded our government and without parallel in history. It is obvious that the prosperity which we now enjoy rests directly upon these resources. It is equally obvious that the vigor and success which we desire and foresee for this nation in the future must have this as its ultimate material basis.

In view of these evident facts it seems to me time for the country to take account of its natural resources, and to inquire how long they are likely to last. We are prosperous now; we should not forget that it will be just as important to our descendants to be prosperous in their time as it is to us to be prosperous in our time.

Recently I expressed opinion that there is no other question now before the nation of equal gravity with the question of the conservation of our natural resources; and I added that it is the plain duty of those of us who, for the moment, are responsible, to make inventory of the natural resources which have been handed down to us, to forecast, as well as we may, the needs of the future, and so to handle the great resources of our prosperity as not to destroy in advance all hope of the prosperity of our descendants.

It is evident that the abundant natural resources on which the welfare of this nation rests are becoming depleted and in not a few cases are already exhausted. This is true of all portions of the United States; it is especially true of the longer settled communities of the East. The gravity of the situation must, I believe, appeal with special force to the Governors of the States because of their close relations to the people and their responsibility for the welfare of their communities. I have therefore decided, in accordance with the suggestion of the Inland Waterways Commission, to ask the Governors of the States and Territories to meet at the White House on May 13, 14, and 15, to confer with the President and with each other upon the conservation of natural resources.

It gives me great pleasure to invite you to take part in this conference. I should be glad to have you select three citizens to accompany you and to attend the conference as your assistants or advisors. I shall also invite the Senators and Representatives of the Sixtieth Congress to be present at the sessions so far as their duties will permit.

The matters to be considered at this conference are not confined to any region or group of States, but are of vital concern to the Nation as a whole and to all the people. These subjects include the use and conservation of the Mineral Resources, Resources of the Land, and the Resources of the Waters, in every part of our territory.

In order to open discussion I shall invite a few recognized authorities to present brief descriptions of actual facts and conditions, without argument, leaving the conference to deal with each topic as it may elect. The

members of the Inland Waterways Commission will be present in order to share with me the benefit of information and suggestion, and, if desired, to set forth their provisional plans and conclusions.

Facts, which I can not gainsay, force me to believe that the conservation of our natural resources is the most weighty question now before the people of the United States. If this is so, the proposed conference, which is the first of its kind, will be among the most important gatherings in our history in its effect upon the welfare of all the people.

I earnestly hope, my dear Governor, that you will find it possible to be present.

Sincerely yours,

(Signed.) THEODORE ROOSEVELT.

Hon. Walter F. Frear,

Governor of Hawaii,

Honolulu, Hawaii.

ARBOR DAY.

PROCLAMATION OF THE PRESIDENT TO THE SCHOOL CHILDREN OF THE UNITED STATES.

To the School Children of the United States:

Arbor Day (which means simply "Tree Day") is now observed in every State in our Union—and mainly in the schools. At various times from January to December, but chiefly in this month of April, you give a day or part of a day to special exercises and perhaps to actual tree planting, in recognition of the importance of trees to us as a nation, and of what they yield in adornment, comfort, and useful products to the communities in which you live.

It is well that you should celebrate you Arbor Day thoughtfully, for within your lifetime the Nation's need of trees will become serious. We of an older generation can get along with what we have, though with growing hardship; but in your full manhood and womanhood you will want what nature so bountifully supplied and man so thoughtlessly destroyed; and because of that want you will reproach us, not for what we have used, but for what we have wasted.

For the nation as for the man or woman and the boy or girl, the road to success is the right use of what we have and the improvement of present opportunity. If you neglect to prepare yourselves now for the duties and responsibilities which will fall upon you later, if you do not learn the things which you will need to know when your school days are over, you will suffer the consequences. So any nation which in its youth lives only for the day, reaps without sowing, and consumes without husbanding must expect the penalty of the prodigal, whose labor could with difficulty find him the bare means of life.

A people without children would face a hopeless future; a country without trees is almost as hopeless; forests which are so used that they can not renew themselves will soon vanish, and with them all their benefits. A true forest is not merely a storehouse full of wood, but, as it were, a factory of wood, and at the same time a reservoir of water. When you help to preserve our forests or to plant new ones you are acting the part of good citizens. The value of forestry deserves, therefore, to be taught in the schools, which aim to make good citizens of you. If your Arbor Day exercises help you to realize what benefits each one of you receives from the forests, and how by your assistance these benefits may continue, they will serve a good end.

THEODORE ROOSEVELT.

The White House, April 15, 1907.

THE DISAPPEARING WHITE PINE.

The position which the United States has held as a lumber-producing nation has, perhaps, been due more to white pine than to any other wood. The timber of this valuable tree which has played a most important part in the material development of the nation is fast disappearing and now it is as costly as the finest American hardwoods.

Rev. Edward Everett Hale, the chaplain of the Senate, who has always taken an interest in forestry, deplores the passing of white pine as our foremost wood, and tells how in his own lifetime he has seen the day when "the masts of every vessel that sailed the Seven Seas were made from New England grown pine; while today very little white pine is cut in New England big enough to furnish a good-sized spar." He tells also, to illustrate the increasing cost of the wood, that he ordered a set of book shelves on which the cabinet-maker made a price, and then asked whether they should be of mahogany or white pine.

The white pine production has shifted from New England to the Lake States, and Michigan was the leading lumber-producing State for twenty years, from 1870 to 1890, with a supremacy based on white pine. In these two decades the cut was 160 billions of board feet, valued, at the point of production, at not less than two billion of dollars, or nearly half as much as the value derived from all the gold fields of California from their discovery in the late forties until the present. The rich forests of Michigan were once thought inexhaustible and lumbering continued in a most reckless manner for years. Suddenly the people awoke to the fact that the thoughtless destruction of the trees had thrown 6,000,000 of acres on the delinquent tax list. These white pine barrens point to the terrible penalty of wasting the forest resources which should have been the heritage of all future generations.

An idea of the increasing scarcity of white pine timber is given by the New York F. O. B. quotations, on a basis of carload lots. "Uppers" of the best grade, cost \$97 to \$114 a thousand board feet, and the "selects" or next lower grade cost \$79.50 to \$99.50. Men who are not yet middle-aged remember the time when these grades could be purchased at \$15 to \$25 a thousand feet. The present quotations on quartered white oak, which are \$75 to \$80, offer another basis of comparison which indicates the condition of the market for white pine.

The best stands of this timber now in this country are in scattered sections in Minnesota, New England, and parts of Idaho. The species in Idaho is sometimes called silver pine. Some of the country's best white pine is found on the Indian reservations in Minnesota and Wisconsin, and scattered stands are found in the States of Wyoming, Montana, Colorado, and one or two other States. At the present rate of cutting the tree will soon be practically a thing of the past. The small stands in the National forests are inconsiderable, but they will be managed with the greatest conservatism by the Government through the Forest Service, and through this method and practice of reforestation it may be hoped that the fine old tree will furnish timber for other generations.

ANOTHER NEW INDUSTRY.

The installation of two modern lime kilns at Iwilei by the Waianae Lime Company, affords another noteworthy example in the movement which has been taking place in Hawaii during the last few years of making the islands independent of the out-

side world for the supply of many important commodities. The annual importations of lime are valued at about an eighth of a million dollars, and if the quality of the new company's product continues to be equal to that of its first samples, there is little doubt that the local firm will be called upon to supply most of the Hawaiian market.

The new kilns at Iwilei are thoroughly modern, and although they bear little resemblance to the old type of apparatus, the process involved in the manufacture of lime is identical with that carried on for countless ages. Each kiln consists in brief of a large vertical steel cylinder, thickly lined with fire brick and having an inside diameter of four feet six inches. The fuel used is oil, and while the calcining process is continued the lime is removed from below and fresh supplies of limestone added to the top of the kiln. The latter is constructed so as to be kept in operation day and night, thus obviating the former method of allowing time for cooling. The lime is collected upon a cement floor, where after cooling, it is packed into barrels and is then ready for shipment. The kilns have an estimated capacity of one hundred tons each per day of twenty-four hours.

The limestone used is quarried at Waianae, from whence it is brought by rail direct to the kilns. The company has also established a cooper shop where it is constructing its own barrels.

THE COLLEGE OF AGRICULTURE AND MECHANIC ARTS.

APPOINTMENT OF ACTING DEAN.

Mr. Willis T. Pope, of the science department of the Honolulu Normal School, has been appointed Acting Dean of the College of Agriculture and Mechanic Arts of the Territory, in the place of the late Mr. J. E. Roadhouse, whose decease was recently announced. The organization of the new institution will be proceeded with immediately on the new High School site near Thomas Square. As soon as the development of the College permits, it will remove to its permanent quarters in Manoa Valley, adjoining the Mid-Pacific Institute, where a tract of over thirty acres of excellent land is reserved for it.

The task of establishing a College of Agriculture and Mechanic Arts in its numerous departments will be no light one. In the selection of Mr. Pope for this work, however, the Regents have acquired one who, besides the ordinary requisites of education and experience, has knowledge of tropical and local agriculture, and possesses the confidence of the community.

Mr. Pope was born in Decatur, Illinois, in 1873. He is a graduate of Kansas Agricultural College, where he specialized in dairy work and in horticulture. During his collegiate course he was also an assistant at the United States Agricultural Station at Manhattan. After holding important agricultural positions in which he acquired valuable knowledge in the practical cultivation and marketing of fruit, he was appointed to the chair of Horticulture at the National Farm School at Doylestown, near Philadelphia, in 1900. In 1902 Mr. Pope accepted the appointment at the Honolulu Normal School, which he is now relinquishing.

NOTES.

COCOA.

Cocoa importations to the United States now average over a million dollars a month in value, against an average of a quarter of that amount a decade ago. The practicability of growing cocoa commercially in Hawaii has not been proved, but it is one of the most promising agricultural experiments which require to be demonstrated. The cultivation of cocoa is a very remunerative asset to many countries similarly situated as Hawaii and is one which in every way is worthy of establishing in the islands.

STRIPPING OF CANE.

The custom of stripping cane which has been extensively followed for many years is one of questioned value. Mr. H. P. Baldwin recently recommended that the Experiment Station of the Hawaiian Sugar Planters' Association conduct an exhaustive series of experiments in order to exactly determine the effect of stripping. He believes that stripping on all plantations was a mistake and was attended by loss of sugar content. It is extraordinary that such a subject as this should still be unsettled, but many plantations still continue to spend large sums annually in stripping cane, while the opponents of the method condemn it as being not only expensive, but as depleting the cane of its sugar.

STOCK PESTS.

At a recent meeting of the Hawaiian Live Stock Breeders' Association, Mr. D. L. Van Dine read a preliminary report upon the insects affecting the cattle industry in the islands. The horn fly was mentioned as one of the worst enemies of stock in the Terri-

tory. This pest was introduced only ten years ago, but it has multiplied at an astonishing rate during this interval. There is every reason to believe that this fly will soon be controlled by its natural enemies. The bot fly was also mentioned in connection with cattle, although it has not developed its full destructive habits in this country.

Of the pests affecting sheep, the blow fly has proved very injurious, especially on Molokai, Hawaii and Oahu. In one year it had caused the death of 5,000 out of 18,000 sheep.

Among the insect pests of horses were the stable fly, the horse bot fly and the mosquitoes. The latter insect worries the animals and causes more injury than is generally appreciated.

BREAD FOR HORSE FEED.

The practice of feeding horses on bread was once very general and it still obtains in many parts of Europe. In Switzerland the bread for this purpose is made into long loaves from third-class rye flour and baked as hard as a brick. One pound of bread is given in the morning and a feed of bread at intervals when halting. Hay and oats are given as well. Animals fed in this manner are said to keep in excellent condition.

SEA-WEED MANURE.

In many countries the use of sea-weed for manure is well known. Where it occurs in sufficient quantities it may be removed from reach of the waves and allowed to rot out during the rainy season, when it will become depleted of its salt and ready for use on the soil.

COCONUTS FOR KAILUA.

One thousand coconut palms were received recently from Kauai on the W. G. Hall by The Waterhouse Company. They will be taken to Kailua, on the other side of the island, and set out on the new copra plantation.

INDEX FOR 1907.

An index for Volume IV of The Forester is in preparation and will be ready to accompany the January number.

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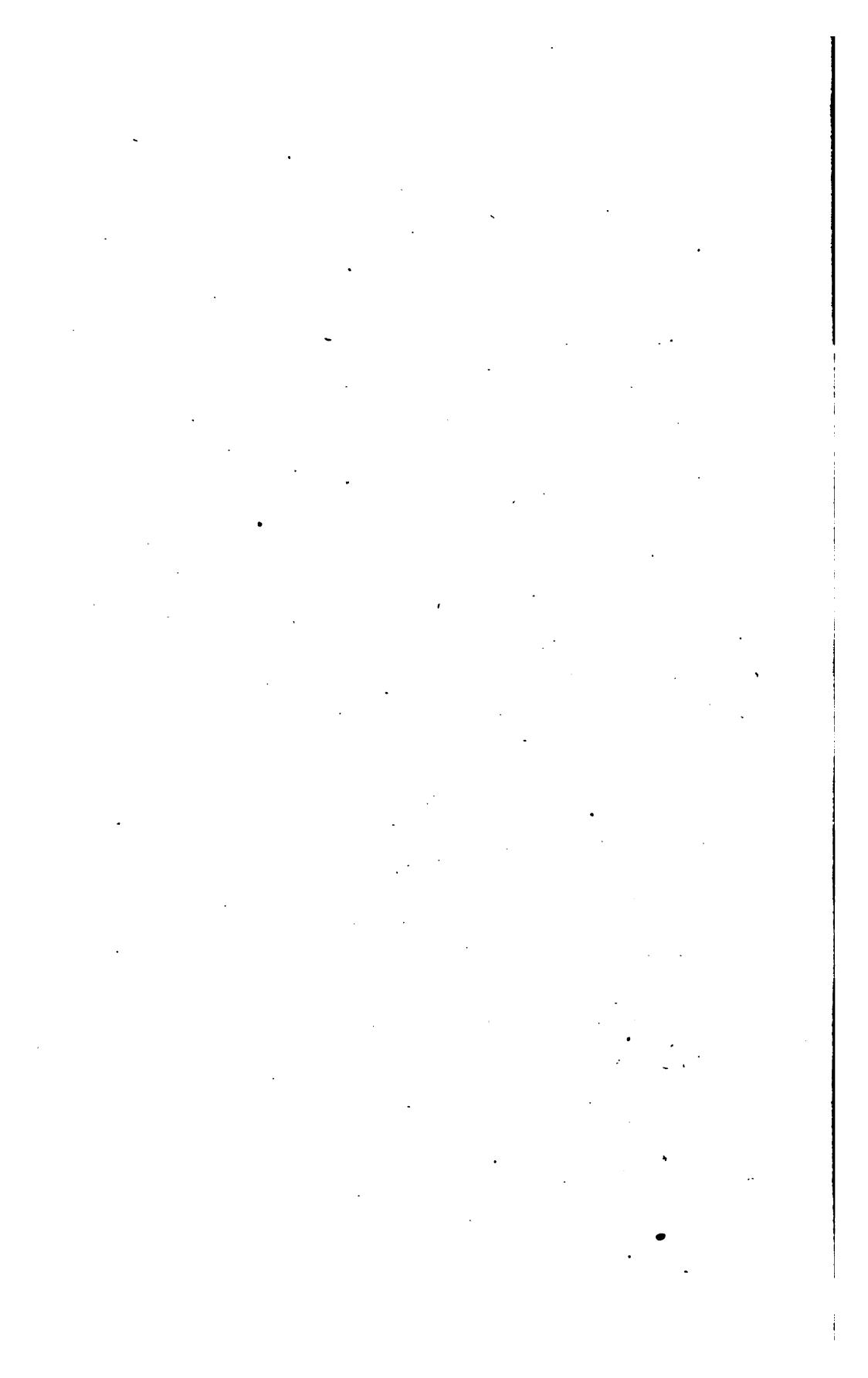
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Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Shower, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50.

All seed is tested before being sent out, which insures its being good. All communications in regard to seed or trees should be addressed to David Haugs, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.

Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.

* First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

Second Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1905; 240 pp.; 8 plates; 10 text figures.

Third Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1906; 212 pp.; 3 plates; 4 maps; 7 text figures.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables, etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by E. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by E. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.

Report of the Division of Entomology, for the year ending December 31, 1905.

Reprint from Second Report of the Board; 68 pp.; 3 plates; 10 text figures.

Report of the Division of Entomology, for the year ending December 31, 1906.

Reprint from Third Report of the Board; 25 pp.; 7 text figures.

DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in Regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.

"Instructions for Propagating and Planting Forest Trees." Press Bulletin No. 4; 4 pp.; 1906.

Report of the Division of Forestry, for the year ending December 31, 1905.

Reprint from Second Report of the Board; 77 pp.; 5 plates.

Report of the Division of Forestry, for the year ending December 31, 1906..

Reprint from Third Report of the Board; 123 pp.; 4 maps.

DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandersed Horse Stock in the Territory." Rule 3; 1 p.; 1905.

Report of the Division of Animal Industry, for the year ending December 31,

1905. Reprint from Second Report of the Board; 62 pp.

Report of the Division of Animal Industry, for the year ending December 31, 1906.

Reprint from Third Report of the Board; 41 pp.; 3 plates.

DIVISION OF AGRICULTURE.

Report of the Division of Agriculture, for the year ending December 31, 1905.

Reprint from Second Report of the Board; 12 pp.

Report of the Division of Agriculture, for the year ending December 31, 1906.

Reprint from Third Report of the Board; 6 pp.

* Out of Print.

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